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ABSTRACT

This monograph, part of a series exploring relationships between education and society, challenges assumed perceptions of time in educational administration as linked to historical and philosophical influences. An introductory summary of salient themes is supplemented by four articles. By emulating industrial capitalistic methods, educational administration's time perceptions and concerns for "efficiency" and "effectiveness" became grounded in scientific management. Time became a commodity that could be segmented, utilized, bought, and sold. This commodification of time was associated with the clock, which ensured regulated production. Student task-continuous work paralleled productivity's emphasis; "time-on-task" emerged from J. B. Carroll's "A Model of School Learning." In "About Time for Educational Reform," H. M. Levin argues that Carroll's views overlook the attraction of internal decision-making participation to enhance achievement. G. J. Whitrow, in "Reflections on the History of the Concept of Time," contends that conceptualizing the physical universe and society as linear advancement without cyclical repetition is not supported by historical evidence. For K. Harris, in "The Secondary School: Administrative Wonder and Educational Absurdity," schooling's master timetable physically places everyone at every moment. Whirring away, day after day, in this clockwork administrative masterpiece, education arrives in a distant second place at best. Each entry provides references; an annotated bibliography is appended. (CJH)

TIME, ORGANISATION AND THE ADMINISTRATION OF EDUCATION

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PETER WATKINS

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EED433 Management of Resources in Schools

Time, Organisation and the Administration of Education

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Richard Bates, *The Management of Culture and Knowledge*
Richard Bates, *Administrative Arenas: The Social Context of Educational Administration*
Brian Caldwell & Jim Spinks, *Policy Formation and Resource Allocation*
Peter Watkins, *Time, Organisation and the Administration of Education*

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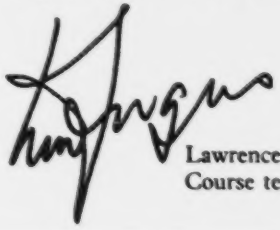
Students enrolled in the course are also supplied with a guide to the course.

Series introduction

This series of monographs critically challenges conventional definitions of school management and school resources. Indeed, it is argued that the most important resources available to schools are cultural. These include conceptions of time, power, appropriate behaviour and dispositions, and knowledge. The management of such resources is considered through an examination of various curricular, pedagogical and administrative processes.

Each monograph develops the significance for educational administration and educational outcomes of such cultural resources. In this way, schooling and educational administration are seen to be inextricably located in a social and political context. The series, then, explores the links between education and society, educational administration and social order, cultural dispositions and educational opportunity, knowledge and hierarchy, school and community. Such issues are discussed at a theoretical and historical level in several monographs and, in others, their adminstrative and educational implications are illustrated by case studies.

An original essay summarising the major arguments concerning education and cultural resources is presented in each monograph. This is supplemented by several key articles. In addition, an annotated bibliography directs readers to important works which are relevant to the themes and issues of the monograph. It is expected that readers will draw connections between the material presented in the series and their own educational experiences. In this way they are encouraged to explore further the cultural and value-laden nature of education and educational administration, and the notion that cultural resources are the most important resources that are managed in schools.



Lawrence Angus,
Course team chairperson

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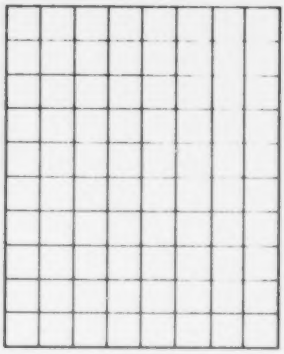
Time, organisation and the administration of education



Introduction

The importance of time in administration is often acknowledged but seldom analysed. Similarly social theory seldom includes any theorising about the importance of time in social action. This may be because notions of time are so pervasive that it is thought safe to take them for granted. However the question of *how* safe it is to do so seems worth querying, for as soon as attention is directed to time as a theoretical problem, several interesting ideas arise which have considerable implications for social and administrative practice. This monograph is concerned with provoking and questioning the taken-for-granted perceptions of time which administrators frequently hold.

By discussing the historical and philosophical heritage which is sedimented in our notion of time this monograph will attempt to lift, in some way, the veil which obscures our vision of time. For the importance that time plays in the administration of schools – from the days spent haranguing students and teachers for their lack of punctuality to the weeks and months spent on parcelling out time to subjects, students and teachers in the form of a timetable – is apparent to all those who work in schools. What is not apparent is why punctuality and time allocation is so important. Has our present perspective of time always been the 'normal' and 'natural' one? How has our view of time been socially constructed? How should time be regarded and how should this understanding influence our view of education? Through the arguments presented in this monograph it is hoped that these questions and others might, in some way, be answered. This monograph seeks to stimulate this critical reflection of time and administration through looking at firstly the historical and philosophical images of time and perceptions of time as linear and cyclical. This is followed by a discussion of the importance of time in the organisation of industrial capitalism and the commodification of time. Lastly the preceding argument is related to the administration of education.

Historical and philosophical images of time

St. Augustine pondered on a number of problems related to time. These in turn generated a number of paradoxes which might be summed up by the following statement. 'What, then, is time? If no one asks me, I know: if I wish to explain it to one that asketh, I know not' (St. Augustine cited in Gale 1968, p. 40). As with so

many other abstract notions St. Augustine set out the enigma of time that has perplexed human beings for so many centuries. The result of this enigma is a number of philosophical problems that have been the centre of philosophical debate for many years. Heath (1936) has reviewed briefly the chief philosophical problems which involve the concept of time.

Heath suggests that 'the problems for the philosopher may be analysed under the following headings: the meaning of the ordinary as well as the scientific notions of *space*, *time*, motion, and *measurement*, and the relation of scientific to immediate experience' (Heath 1936, p. 13). Firstly, he asks what the relations of time, motion and rest are. Are they inherently compounded? Or are they conceptually distinct, though often operationally intertwined? Secondly, can time be measured and can there be more than one valid time? In the light of Einstein's theory of relativity, is time objective or subjective? Thirdly, is time to be thought of as homogenous, where each minute is the same as any other, or as epochal where each minute is unique? Fourthly, is time to be thought of as continuous and holistic, or as atomistic and divisible made up of separate units strung together? 'In other words does the quantum theory suggest an atomic idea of time?' (Heath 1936, p. 16). Fifthly, is time to be regarded as linear as in physics or should it be regarded as cyclical or recurrent as in biology? Sixthly, is time to be regarded as real, in the sense of being concrete and having direct effects or is to be regarded as not real, in the sense of being only an abstract dimension? The former could be said to be a biological view of time while the latter would be the view from mathematics or physics (Heath 1936). However even in such a discussion of time there arises the problem of dichotomy.

In a similar survey of the problems associated with the conceptualisation of time, Zwart notes that in any discussion of the philosphical conundrums that entwine a philosophy of time:

> We see: problems galore. And besides these more or less particular problems there are of course also a number of general questions, concerning the nature of time, its origin or the origin of our concept of time the question whether time is fundamentally a physical or a psychological phenomenon and so on.
>
> (Zwart 1976, pp. 8–9)

He concludes that 'The existence of so many problems of time is obviously due to the fact that the commonsense concept of time is highly problematic and inconsistent' (Zwart 1976, p. 9).

In its historical context time seems to have been gauged through an external reference scale on which a temporal conceptual basis could be built. The rising of the sun, its setting and the phases of the moon were all recurring events which were easily observable both in early and contemporary societies. These events brought to these early societies a sense of rhythm. Associated with this rhythm of the sky were religious rituals whose observance and repetition signified a form of demarcation and sense of measurement. As Whitrow explains:

> One of the oldest and most widespread conscious expressions of this idea is to be found in myths concerning the moon, many of the most ancient civilisations – for example that of Ur – being based on moon worship. The lunar phases presented a vivid example of eternal repetition and provided a more obvious unit of time than the solar year. Also in the Indo-European languages we find that most words for month and moon derive from the name root *me* producing in Latin, for example, *menis* and *metior*, 'to measure'. Again, in the religion of the ancient Egyptians, the scribe of the gods who endowed mankind with the arts of writing and counting was Thoth, the moon god, who as the divider and measurer of time was the lord over exact and immutable measurement.
>
> (Whitrow 1980, p. 57)

Similarly in the Europe of the Middle Ages time and its measurement were essentially associated with religious activities rather than any secular practices. Thus early clocks were developed in a response to the requirements of churches and monasteries for a reasonably accurate marking off of the hours when significant prayers should be said and various other religious activities practised. In England church and public clocks were erected in the major cities and towns from about the fourteenth century onwards so that the bells could mark the religious practices of the day. However 'the accuracy of these clocks is a matter of dispute; and the sundial remained in use (partly to set the clock) in the seventeenth, eighteenth and nineteenth centuries' (Thompson 1967, p. 63).

However with the rise of industrial capitalism the church clock and its bells were machines against which the factory siren or hooter was set. Work and social behaviour were regulated, standardised and reinforced by the authority given to the clock. Further, with the invention of the pendulum clock in the seventeenth century the factory system could be regulated by an accurate keeper of the time which would keep ticking on for year after year. This invention coupled to the Protestant 'work ethic'

consolidated the view of time as a continual progression in a linear perception of time (see Whitrow 1980).

The pendulum clock perfected mechanical time which was separated and objectified from our own biological time. The primary utilisation of mechanical time resided in the needs of industry which required a conception of time founded on linear, objective and equal units. This image of time, which dominates our vision in contemporary society, derives from Newton. Time does not repeat itself but moves in a continual flow analogous to the assembly line for which such an image was so right. Philosophically Newton's conception of time was developed by Locke. For Locke time was independent of, and separated from, the individual person. Time did not derive from an individual's biological constitution. Rather the individual's biological make-up was set against the backdrop of an extraneous, objectified time which is common, measurable and commensurable.

Locke argued that the essence of time was entailed in the concept of measurable duration in terms of regular and equidistant intervals such as minutes, hours, days and years which enables the conception of a past and future. This is a parallel to Locke's philosophy of individualism and particularism for 'the notion of personal identity as finite existence depends on temporal and spatial specificity' (Wood 1983, p. 161). Locke defined time in the following way:

> Having thus got the *Idea* of Duration, the next thing natural for the Mind to do, is to get some *measure* of this common *Duration*, whereby it might judge of its different lengths, and consider the distinct Order, wherein several things exist ... This Consideration of Duration, as set out by certain Periods, and marked by certain Measures or *Epochs*, is that, I think, which most properly we call *Time*.
>
> (Locke 1975, p. 187)

Thus for Locke time was duration as set out by measures. Following Newton's conception of time, he argued that time is ontologically prior to any human conceptualisation or measures; that is its existence is prior to the rising and the setting of the sun; prior to the phases of the moon; prior to the rise and fall of the tides; and, prior to the clock. Even if none of these phenomena existed time itself would still exist. The concept of time was reified in this way. However Zwart has argued that such a notion of time as absolutely independent of all human factors is meaningless and redundant (Zwart 1976, p. 25). He presents his case by asking the question:

> For what is the sense of a notion that has no use whatsoever? We cannot measure absolute time, we cannot express the duration of an interval in absolute time nor can we express a rate or a velocity with the help of absolute time. We can only measure durations and velocities by comparing one process with another, but since the flow of absolute time is unobservable, and since the relationship between the rates of two processes is completely independent (by definition) of the rate of this flow, all our measuring results are completely independent of any quality or property which this absolute time could have.
>
> (Zwart 1976, p. 25)

He concludes on the basis of the above argument that any notion of time existing independently and in an absolute fashion lacks theoretical coherence.

However a notion of time which is linear and which does not repeat itself is useful to the organisation of industrial capitalism. According to such a position the future, tied to production, extends infinitely in a time which is homogeneous; divisible into an infinite number of units and so is measurable and objective. Such a view gives rise to the metaphors of time being a limited resource that can be wasted and of time being perceived as money, indeed as being quite valuable. This metaphorical conception of time will be discussed later. But firstly, in the next section, the concepts of linear time and cyclical time will be examined in more detail.

Perceptions of time

People perceive time in two basic fashions. Time can either appear to flow, in an ongoing stream of events and moments or it can seem to be a series of cycles correlating to the sequence of nature reflecting the beginning and ending of days, season and years.

Linear time

In Newtonian physics there is a recognition that time flows in one direction. In this sense time has a unidirectional flow incorporating a dynamic view entailing various meanings. Time can be seen as time in motion as in dynamics, or time connected to irreversibility as in thermodynamics.

The traditional view of time involves a reference of a simple coordinate dimension which is assumed or inferred from the observations of scientists. Newtonian physics posits time as absolute and universal. Indeed Newton's Laws of Motion arose from a consideration of time and change. While space and time are

intimately linked Newton considered that both were absolute and that all places in his conception of the universe could be linked by the identical moment of 'now'. Fraser highlights this conception of time when comparing Newtonian physics to the Relativity Theory of Einstein.

> In the world of Newtonian kinematics, which is the study of motion in terms of velocities, the answers to inquiries 'When is then?' and 'Where is there?' are easily found because of the assumption of a framework of ... absolute time to which all events may be referred. In Relativity theory answers to the same questions are, however, complex and embody two major discoveries: 1. the existence of distant space-time domains of unverifiable simultaneity to the here-now and 2. the dependence of clock readings on the relative motion ... and gravitational environment of the observer.
> (Fraser 1972, p. 481)

Einstein felt that 'in order to study the temporal aspect of nature effectively, men have strained their ingenuity to devise means whereby the peculiar characteristics of time are either ignored or distorted' (Whitrow 1980, p. 3). The development of a more complex view of time has raised questions on the experience of timelessness, on time reversal, on systems operating outside time and on whether there can be more than one time.

With the break from Newtonian physics the linear motion of an absolute conception of time has had to be rethought. Indeed 'the concept of time is much more complex than we previously thought. Time associated with motion was only the first aspect that could be incorporated consistently into the framework of theoretical structures such as classical and quantum mechanics' (Prigogine 1980, p.xvi).

Cyclical time

This perception of time is related to the biological rhythms which all life experiences in relation to the cycles of the day, the season and the year. In the early history of man the wash of life events was linked to a continuous cycle of temporal events. Actions and practices were tied to the rising and setting of the sun, the resurgence of plants in spring, the first frost in autumn, the flights of migratory birds and the rise and fall of the tides.

The complex, cyclical pattern of natural events is such that 'the overwhelming universality of biological rhythm, the realization that synchronism between the organism and its environment is imperative for survival and the possibility that spatial information may derive from temporal encoding suggests that life might more properly be regarded as a program than a structure' (Fraser 1972, p. 492).

This cyclical programming is evident in human beings, through the circadian rhythms which conform to an approximate 24-hour cycle. These constitute a biological clock which controls and influences a wide range of human behaviours. These behaviours include the sleep-wake cycle; the rapidity of the heart beat; the oxygen intake and body activity. The problem of jet-lag is directly related to a break in the circadian rhythm when the body has to adjust to a new daily cycle.

Similarly, the artificial intrusion of work patterns imposed by regular working hours which are governed by the temporal requirements of an employer can have their effect on and in turn can be affected by human beings' circadian rhythm. Not only can shift work and 24-hour work sequences have their effect but merely the concepts of punctuality and the mechanical rule of the clock may lead to alienation and other detrimental effects in the workplace.

In the next section of this monograph, we will extend our discussion of ways of viewing time by looking at the conceptualisation of time in primitive and feudal societies. This will be contrasted with the view of time which arose with the organisation of industrial capitalism and the subsequent influence this view of time has had on the administration of education.

Temporal control and the organisation of industrial capitalism

In this section we will firstly look at how human perception of time changed with the rise of industrial capitalism. This will be followed by an examination of the importance of time in the development of time and motion studies which were applied to organisations. Lastly the influence of this changed perception of time on schools will be examined.

Time and the development of capitalism

In historical terms with the rise of capitalism and the demise of feudalism there occurred a transition in the way time was conceived and perceived. There came about a change from the earlier large-scale wash of time punctuated and interspersed with rural activities to the regulation and control which was required by the emergent industrial system.

While there were church clocks within medieval villages, these appeared to have little effect on the daily lives of the ordinary people. The lives of village people was essentially task oriented. It was the rhythm of the seasons which set the agenda for the

organisation of the villagers' daily, weekly, monthly and yearly activities.

In this context, the peasant took it for granted as a normal fact of life that 'lambs conceived at Michaelmas would be born before Candlemas, that ploughing would be over by Andrewmas; that ewes could go to tup at St. Luke; that servants were hired at Martinmas and that hay fields should not be grazed for more than a fortnight after Lady Day' (Thrift 1981, p. 58). As time was viewed in harmony with the rhythm of the seasons it had an essential opacity in which punctuality was of no consequence and was given no importance. This latter view of time is a recent industrial phenomenon for in feudal and primitive societies time was and is seen in reference to important activities. In such societies, there seems to be often no abstract conception of time. In his discussion of time-reckoning amongst the Nuer people, Evans-Pritchard points out that

> strictly speaking the Nuer have no concept of time and, consequently, no developed abstract system of time-reckoning ... there is no equivalent expression in the Nuer language for our word 'time', and ... they cannot, therefore, as we can speak of time as though it were something actual, which passes, can be wasted, can be saved, and so forth ... Certainly they never experience the same feeling of fighting against time ... since their points of reference are mainly the activities themselves, which are generally of a leisurely and routine character.
>
> (Giddens 1981, p. 36)

Similarly Bourdieu in his study of the Kabyle in Algeria indicates that the tempo of everyday life is related to actual, concrete actions and practices engaged in by these people. These practices form a series of identifiable moments characterised by particular forms of work. Any progression to an abstract conception of calendar belies a sense 'of incommensurable islands of duration, each with its own rhythm, the time that flies by or drags, depending on what one is *doing*' (Bourdieu 1977, p. 105).

But with the onset of industrial capitalism the quantification of life into precise time segments coupled with abstractions like punctuality became important to the smooth functioning of the factory. The factory whistle, adjusted to the owner's timepiece, set and governed the pace from the start of the working day. The rise of the factory system, especially from the mid 1700s, resulted in an increasing number of workers being forced into occupations whose starting and finishing times were a function of the clock. These people found the adjustment to the discipline of the clock

extremely difficult. For 'these were people who were accustomed to work at their own pace, to make their rest and distraction, or for that matter relieve themselves, as and when they pleased ... Coming as they did from cottages and fields, they felt the factory to be a kind of jail with the clock as the lock' (Landes 1983, p. 229). The most frequent form of contestation which these people could give vent to was to come late or not at all. Consequently the harshest sanctions and penalities which employers dealt out were related to absenteeism and unpunctual behaviour.

The authority of the clock in providing work and sustenance was reinforced by the protestant ethic which secularised man's conception of time. To this end 'Protestantism refused to recognise the saints, thus taking away the 100 days assigned to their celebration. Before this, one could not work on such days' (de Grazia 1972, p. 452). This regulation and routinisation of people's lives marks the start of the tyranny of the clock. Indeed, Lewis Mumford has written that 'the clock, not the steam-engine is the key machine of the modern industrial age ... the source of power and the transmission were of such a nature as to ensure the even flow of energy throughout the works and to make possible regular production and a standardised product. In its relationship to determinable quantities of energy, to standardisation to automatic action, and finally to its own special product, accurate timing, the clock has been the foremost machine in modern technics' (Mumford 1973, pp. 271–2).

But Thompson (1967) has claimed that it took at least a generation to discipline craftsmen into the order and regimentation of the factory system. In this period the watch and the timing of the day were still the prerogatives of the capitalist. As one worker explained:

> I worked at Mr Braid's mill ... There we worked as long as we could see in summer time, and I could not say at what hour it was that we stopped. There was nobody but the master and the master's son who had a watch, and we did not know the time. There was one man who had a watch ... It was taken from him and given into the master's custody because he had told the men the time of day.
>
> (Thompson 1967, pp. 85–6)

However, while the first generation of workers were taught the importance of time by the factory owners, the second generation formed oppositional movements to shorten the work time. Then the third generation used industrial action to achieve overtime and time and a half for they had absorbed the capitalist credo that time is money.

One centre of opposition to the regulation of the working week was the observance of 'Saint Monday'. Even in the mid-eighteenth century, Monday was kept as rest day by the great majority of the working class (Reid 1976). Landes notes that at this time 'Sunday was holy, Monday was holy and Tuesday was often needed to recover from so much holiness' (1983, p. 229), while Pollard (1963) comments that with regard to the time-discipline needed in the organisation of factories St. Monday and feast days were recurring problems. Some workers were used to 'play frequently all day on Monday, and the greater part of Tuesday, and work very late on Thursday night, and frequently all night on Friday' (Pollard 1963, p. 256). A number of popular ditties and poems celebrated the sports and recreational activities which marked Monday. The poem 'Saint Monday' was dedicated to 'Sir Benjamin Faulkner – Puissant Pugalist':

> Accept my panegyric – tis your due;
> For you, the most of all I ever knew,
> Have honour'd great St. Monday's noisy cause;
> And gain'd the mobs unbounded, loud applause.
>
> (Reid 1976, p. 79)

However the inculcation of both time discipline and the lack of a strong political opposition to the employers coupled with economic constraints through the sub-letting of steam power led to the demise of Saint Monday. In addition with the steady rise of consumerism regular work combined with a regular wage ensured a more stable attendance at the work place. But also, Pollard (1963) notes that the concept of time-thrift had to be introduced to erode the natural impulses of workers. For the organisation of the factory meant economy of time and ' "enforced asceticism". Bad timekeeping was punished by severe fines, and it was common in mills ... to lock the gates of the factory, even of the workrooms, excluding those who were only a minute or two late' (Pollard 1963, p. 257).

The rising middle class proclaimed in the *Aris's Gazette* that '"St. Monday" is not an institution which meets with our general approval' (cited in Reid 1976, p. 98). For the whole idea of St. Monday was incompatible with the ideology of the new ruling class. In commenting on the activities opening the Edgbaston Botanical Gardens on a Monday, a journalist wrote that it

> encourages the working classes in the bad habit of keeping 'Saint Monday' ... They are already well enough disposed to do so and to waste a day that should be devoted to honest labour. They need no further inducement of this or any other kind.
>
> (Reid 1976, p. 99)

While the ideology of honest labour and time discipline sought to be the dominant hegemony in the work place, the oppositional concept of Monday still persists. Even today in our present highly regularised and time disciplined, industrial society anybody who has had to administer an organisation will substantiate the fact that the tradition of Saint Monday is culturally embedded and still persists in the form of Mondayitis. Nevertheless F. W. Taylor and his contemporary disciples have attempted to enhance time discipline through time and motion engineering. This concept will be explored next.

Time and motion

Central to any discussion of the development of industrial capitalism should be the work of F. W. Taylor whose concept of scientific management was aligned closely to the development of the stop-watch. The emergence of this technology allowed the technique of time and motion studies to be developed. Initially this was done by Taylor but later it was developed by his disciple Frank Gilbreth. Gilbreth's contribution consisted of analysing and abstracting the motions of individuals within a specific time frame. 'There was no longer a being in motion, but a point; not a series of acts, but a curve, a trajectory in abstract time and space' (Ellul 1964, p. 330). Time and motion studies were supposed to be precise methods for analysing the content of the labour and skills employed in what had been usually traditional craft industries. The use of the stop-watch would provide 'scientific' evidence of the amount of effort and labour power that a worker would need to accomplish a particular task. It would maximise time on the task while eliminating any wasted, non-productive time. Through the timing of work by means of a stop-watch, the time study engineer could eliminate any 'waste' or 'unnecessary' motions. Consequently, 'waste' motions would be eliminated and time on the task could be maximised. Also the use of the stop-watch allowed the study to take on a quantified scientific appearance through the development of formulae.

As Taylor explained when applying time and motion study to excavation work in 1911: 'Formulae are convenient for combining the elements. For simplicity, in the example of barrow excavation, each unit time may be designated by the same letters used on the note sheet ... although in practise each element can best be designated by the initial letters of the words describing it. Let

a = time filling a barrow with any material.
b = time preparing to wheel.
c = time wheeling full barrow 100 feet.
d = time dumping and turning.

e = time returning 100 feet with empty barrow.
f = time dropping barrow and starting to shovel.
p = time loosening one cubic yard with a pick.
P = percentage of a day required to rest and necessary delays.
L = load of a barrow in cubic feet.
B = time per cubic yard picking, loading, and wheeling any given kind of earth to any given distance when the wheeler loads his own barrow.

Then

$$B = \left(p+[a+b+d+f+\frac{\text{distance hauled}}{100}(c+e)]\ \frac{27}{L}\right)(1+P)'$$

(Taylor 1974, p. 159)

However not only was the work of people to be analysed 'scientifically' by use of the stop-watch but also the work was to be broken into smaller units. Skills were to be decomposed into simpler, more narrow activities under the eye and stop-watch of management. In this way power was transferred from the employee to management. Taylor explained that:

> It is ... equally true that all of the work done in a given trade can be divided into a comparatively small number of elements or units, and that with proper implements and methods it is comparatively easy for a skilled observer to determine the time required ... to do any of these elementary units.
> Having carefully recorded the time for each of these elements, it is a simple matter to divide each job into its elementary units, and by adding their times together, to arrive accurately at the total time for the job.
>
> (Taylor 1974, p. 167)

The timing of jobs through the stopwatch allowed Taylor to determine the maximum time that a person should spend on a particular activity. Such studies allowed management to decide if any time was being wasted on unproductive activities. The studies also led to the fragmentation of work ensuring greater management control over the labour process. Taylor claimed that it could now be scientifically proved how much time a worker should spend on a particular task and how much time a sequence of tasks should take in a day or week. But it is problematic to assume that what should be done is the maximum output of labour power by any employee. Also with the repetition of the task Taylor attempted to allow for the increased facility which might come about through such repetition by reducing time. The consequence was that the 'scientifically necessary time' was frequently less than the total

time. Further the determination of what was wasted time and what was not by the time-and-motion engineer was also contentious especially as the engineers were not frequently very well acquainted with all facets of the jobs.

The information derived by the engineer not only treated the worker as a machine-like entity but also elevated the organisation and administration of work to an allegedly scientific plateau. In this vein Nadworny has noted that 'although scientific management employed many identifiable and characteristic mechanisms, its most prominent tool was the stopwatch, the popular symbol of the scientific management movement. The stopwatch symbolized the new approach to management: "management based on measurement" ' (Nadworny 1955, p. vi).

Such an approach to management has kept its popularity in the business world and has also, as will be shown later, influenced traditional thinking in the administration of education. The ongoing popularity of these studies can be explained partly by the so-called scientific status they bring to administration and partly by the greater degree of control they confer on management. As Braverman notes 'the time values of given motion patterns are respected in management circles as "objective" and "scientific", and bear the authority such values are presumed to carry. In recent years (they) have had their logic and arithmetic assigned to computers, so that the time allowance for various job elements is worked out by the computer on the basis of standard data, perhaps supplemented by time study observation' (Braverman 1974, p. 178).

In the present workplace the application of time and motion studies is not merely confined to the factory and assembly line. With the development of micro-technology the office is also being regularised and 'scientifically' systemetised. The result is what Downing (1983) and Feldberg & Glenn (1983) have described as a white collar assembly line where word processors not only record the time operators spend on each individual task but also the time spent away from the operator's station. The so called white collar workers are now being subjected to the time and motion studies of scientific management which have previously been more evident on the shop floor and in other spheres of work. Downing (1983) in research into female work in the banking area has graphically described how time and motion concepts have been incorporated into the new technology installed in the San Francisco branch of a large United States bank. The word processing centre contains one hundred and ten word processor operators all seated in a series of rows. While sitting at work no talking, smoking or eating is permitted. In addition for each group of about thirty operators

there is a supervisor who controls, times and logs visits to the toilet. If a person spends more than the alloted time in the toilet this is noted on the person's report. The technology itself also provides back-up monitoring and control. Surveillance of the operator's time and motion is programmed into the machine through the recording of specific and total work times and key strokes, as well as recording how long the operator has been absent from the work station. Such ideas are not new. Earlier a protégé of Taylor, Leffingwell, had argued that:

> Time and motion study reveal just as startling results in the ordinary details of clerical work as they do in the factory. And after all, since every motion of the hand or body, every thought, no matter how simple, involves the consumption of physical energy, why should not the study and analysis of these motions result in the discovery of a mass of useless effort in clerical work just as it does in the factory.
>
> (Braverman 1974, p. 307)

Just as earlier in this monograph it was shown that Taylor divided up the work of excavating with a pick, shovel and barrow into fragmented units each with a specified maximum time on task, so too has this procedure been applied to modern office work. The Systems and Procedures Association of America issue *A Guide to Office Clerical Time Standards: A Compilation of Standard Data Used by Large American Companies*. This 'scientific' data has been compiled from such large companies as the General Electric Company and the General Tire and Rubber Company. Management is given a set of standards in unit time values by which various tasks are organised and synchronised to maximise the maximum production time on task. These unit time values for simple fragmented tasks can be illustrated by the following

Open and Close	**Minutes**
File drawer, open and close, no selection	.04
Folder, open or close flaps	.04
Desk drawer, open side drawer of standard desk	.014
Open center drawer	.026
Close side	.015
Close center	.027
Chair activity	
Get up from chair	.033
Sit down in chair	.033
Turn in swivel chair	.009
Move in chair to adjoining desk or file	.050

(Braverman 1974, p. 321)

Clerical work is routinised and fragmented through these aspects of scientific management. Employee autonomy and mental involvement are curtailed through repetition and the routinisation of work into fragmented tasks. While employees never lose all power, the balance of power can be shifted through these techniques from the employee to management. Time and motion studies are consequently important tools in the control of the workforce by management.

The changing perception of time which arose with industrial capitalism and the conception of time thrift and time discipline which had its most extreme manifestation in time and motion studies greatly influenced the administration of schools. Schools were seen as playing an important part in raising the time consciousness of both teachers and students. This theme is explored in the next section.

The role of education

The place of the school in the changing perception of time in relation to the development of industrial society was of great importance. Elementary schools in the nineteenth century were seen as being of use in inculcating the punctuality, time discipline and facility with timetables required in the workplace. For it was hoped that 'the elementary school could be used to break the labouring classes into those habits of work discipline now necessary for factory production. Sunday schools were commended for providing a spectacle of order and regularity: and for making workers both more 'tractable and obedient' and more punctual in their attendance' (Thrift 1981, p. 65). Schools had the virtues of punctuality, regularity and time consciousness written into and made explicit in their rules. One school proclaimed that 'every scholar must be in the school-room on Sundays at nine o'clock in the morning, and at half past one in the afternoon, or she shall lose her place the next Sunday and walk last' (Thompson 1967, p. 84). But it was not only the students who had to be subjected to this new tyranny of time, teachers also were cautioned on the need for punctual and regular habits. Teachers at the Methodist Sunday schools in York were fined if they were not punctual. Students learned as the first rule of the school that 'I am to be present at the School ... a few minutes before half-past nine o'clock' (Thompson 1967, p. 84).

Reid (1976) argues that the available evidence indicates that those 'steam engines of the moral world'–the schools–placed important emphasis on the 'habits of industry'. Employers saw schools as an essential force in inculcating punctuality and time discipline into the children of artisans. As one employer noted

when acknowledging the correlation between the habits taught at school and those required at work:

> The best educated are the most valuable workmen; they are generally more attentive to their business, do not so much neglect it in the beginning of the week; and take more pride in it ... the more ignorant on the contrary will neglect their work in the beginning of the week, with the notion that by overworking towards the end they will make up the lost time.
>
> (Reid 1976, p. 94)

However, it was not only English schools which sought to make students increasingly time disciplined and time conscious in line with the demands of the new industrial regime. In Australia too the contemporary evidence of the nineteenth century stresses the habituation of students to the moral virtues of discipline, regularity and punctuality. An example of this is given in the educational pamphlet of 1857, *School Conduct*. Here it is argued that:

> It is at school, and at the period of life when habits are most readily contracted and acquired, that such education must be taken up – that boys and girls must be impressed with the advantages of practising the observances of cleanliness, order, punctuality, courtesy and decency which are met with among the well-informed and intelligent people of their neighbourhood, and of avoiding those habits which would make them disagreeable as associates or despised as acquaintances.
>
> (Austin & Selleck 1975, p. 37)

Schools were seen as places where reform of unacceptable or disagreeable habits and practices could take place. Time in schools could be occupied by fruitful, disciplined, moral activity. Timetables governed the work time in schools where as Foucault (1977, p. 150) indicates 'the division of time became increasingly minute; activities were governed in detail by orders that had to be obeyed immediately'. While the school bell heralded school time, play time, lunch time and home time, the clock on the wall mechanically beat out the relentless passing of measured time.

Many parents and students resisted this enforced regulation of their life. They ignored the bells signifying school time at the start of the school day and refused to be controlled in this way. Indeed, Davey has noted that in Australia 'for the majority, both working class and petty bourgeois and urban and rural, even the limited extension of the dependency model of childhood associated with the introduction of compulsory schooling between the ages of seven and thirteen was ambiguous. Schooling remained very much

a part-time activity for all but the most wealthy . . .' (Davey 1982, p. 446). By 1899, in Victoria, only about 60% of children in the compulsory schooling age bracket attended school. Even by 1929 the gross enrolment figure was still only about 70% in Victoria. 'The resistance to compulsory schooling was far greater than was ever publicly admitted, and it was only after a relentless, punitive campaign against the recalcitrant parents in the 1920s and 1930s that universal elementary schooling came close to reality in Victoria' (Bessant 1982, p. 443). By then punctuality had been accepted by the majority of people as a 'natural' value and virtue, while time became a commodity which could be segmented, utilised, bought and sold. It also became objectified and removed from the personal lives of people. This theme of the commodification of time will be explored in the next part of this monograph.

The commodificaton of time

The preceding section outlined the changes in the way people perceived time accompanying the rise of industrial capitalism. A consequence of these changes was that under capitalism there occurred a complete temporal reorientation of society. This resulted from the commodification of time. In primitive and feudal societies, for example, where time is sedimented in the dialectic of daily life and traditional life, time is part of the experiences resulting from the re-enactment of traditional practices. However such traditional practices were removed under capitalism. Their replacement was typified by the factory, where the meshing of power machinery to the standardised system of production was facilitated by the clock. The clock became a major instrument of control and co-ordination. Consequently the situation that results is the overall, objective control of clock time which 'is the very expression of commodification of time; time as "measured duration" *is* commodified time, separated from the contents of existence' (Giddens 1981, p. 9).

Giddens (1981) argues that the commodification of time is closely linked to the invention and technological development of the clock. With the rise of capitalism the clock was able to ensure that production was regulated and standardised. The precision of measurement which characterised the clock allowed time to become objectified and separated from the lives of people. Consequently

> the clock, much more than power-machines, is the foremost example of that conjunction of science and technology that has become such a distinctive feature of the capitalist

> economy. Precise time-measurement was both a prime stimulus to, and contributing element in, the standardisation of other dimensions of measurement ...
>
> (Giddens 1981, p. 134)

The rise of industrial capitalism was facilitated by the precision, standardisation and uniformity of units made available by the clock. For central to any discussion on the commodification of time is the significance of the creation of time with a 'double existence' in which, as in other processes of commodification associated with capitalism, the universal, abstract, quantifiable expression of time comes to predominate over the qualitative organisation processes characteristic of all 'non-capitalist forms of society' (Giddens 1981, p. 134).

But the commodificaton of time also impinges on the labour contract. Industrial capitalism is analysable in terms of the way time, labour and the products of labour have become commodified. These considerations are also important in presenting forms which can lead to the organisation and management of people and institutions.

With the development of industrial capitalism labour and its products were transformed into commodities linked by markets. Commodity relations in the workplace were achieved through the separation of the peasant or worker from the means of production. In this situation the worker had no traditional bonds but was free to sell his or her own labour power to the owners of capital. Consequently labour power became a commodity which was bought and sold on the labour market.

The commodification of labour power marked a change in the social relations between people. Daily life became marked by commodity relations where social relations were distinguished through the mediation of cash relations. In this way wage labour and cash relations resolved the personal worth of people into a form of exchange value. But time and money are also exchangeable. Graham (1981) points out that time can be converted into money, time can be bought by money, the value of money can increase over time while time can be invested to gain money at a later date. The development of such a view of time in terms of exchange value has given rise to a number of metaphors which Lakoff & Johnson (1980a) claim characterise industrial capitalism. The dominant conceptions in the commodification of time may be expressed through the metaphors that firstly time is money, secondly time is a limited resource and thirdly time is a valuable commodity.

Any illustration of metaphorical expressions which indicate the commodification of time in our present culture would perhaps include:

You have to be careful that pupils do not *waste* their time.
I don't have the time to *give* you.
The group *invested* a lot of time in that project.
The team will have to *budget* their time carefully.
Students should use their time *profitably*.
Students *lose* a lot of time by inattentiveness.
In class pupils should *spend* their time wisely.

Lakoff & Johnson argue that 'corresponding to the fact that we *act* as if time were a valuable commodity, a limited resource, even money, so we *conceive* of time that way. Thus we understand and experience time as a kind of thing that can be spent, wasted, budgeted, invested wisely or poorly, saved or squandered' (Lakoff & Johnson 1980b, p. 457). But such actions and conceptions relate to a particular historical, social and economic context. Not all cultures perceive time in the same way. Indeed as has been argued in this monograph the present view of time which our society takes so much for granted is a recent phenomenon. To illustrate this point, Graham (1981) describes the perception of time during the holding of ceremonies at an American Indian Reservation. For the Indians, things are done traditionally when 'time is right'. Time is not segmented into units or specific amounts. Once the activities begin, their stages and conclusions have no time dimension.

In such a procedural-traditional approach to time, as Graham illustrates, 'time and money are totally disjointed concepts, and people who share this perception would have great difficulty in fathoming some relationship between the two. Likewise, the idea of the consumption of time as a consumer good is totally inappropriate under this model' (Graham 1981, p. 337). However, under capitalism the work of people or their labour power could be bought in relation to the time spent on the job. Thus work could be bought on the basis of ten hours a day or sixty hours a week. Such a form of temporality, however, is completely alien to the vast majority of traditional societies (see Berger, Berger and Kellner, 1973, p. 149).

The commodification of labour power meant that units of time were being bought by the owners of capital. Time rather than a particular ability or effort was the commodity bought in the work exchange. People sell their labour power in order to live. Labour power is an additional cost to capital. However, all commodities produced or services rendered are an objectification of the time spent on the work, thus the socially necessary labour time governs the value of the commodities and makes them divisible and quantifiable into units of time. From this de Grazia (1972, p. 452) comments that, 'time begins to be money and like money a

valuable, tangible commodity, to be saved, spent, earned and counted'. In similar vein Giddens argues that:

> The commodification of time ... supplies the clue not only to the transformations in social institutions brought about by capitalism, but also to the manner in which 'production' or 'the economy' assumes an importance in capitalist society quiet foreign to all class-divided societies.
>
> (Giddens 1981, p. 8)

Marx points out that the relationship between labour power and production implies a commodification of time. 'We know that the daily value of labour power is calculated upon a certain length of the labourer's life, to which, again, corresponds a certain length of working day' (Marx 1906, p. 590). Indeed neo-classical economists such as Becker (1962) acknowledge that in the contract between employer and employee the purchase labour time is specified rather than the quality of the work.

Marx also argues that in deciding exchange values the amount of labour time inherent in a commodity will govern its value. The ability to quantify the value of a commodity into units of time underlies the way commodities can be equated and exchanged. Thus when exchanging one commodity for another:

> The commodity first has to be transposed into labour time, into something qualitatively different from itself (qualitatively different (1) because it is not labour time as labour time, but materialized labour time; labour time not in the form of motion, but at rest; not in the form of the process, but of the result, (2) because it is not the objectification of labour time in general, which exists only as a conception (it is only a conception of labour separated from its quality, subject merely to quantitative variation) but rather the specific result of a specific, of a naturally specified kind of labour which differs qualitatively from other kinds), in order then to be compared as a specific amount of labour time, as a certain magnitude of labour, with other amounts of labour time, other magnitudes of labour.
>
> (Marx 1973, p. 143)

The equation and calculation of the monetary worth of goods is an example of the commodification of the relations of production where personal worth has been converted into exchange value. In the juxtaposition of labour power the mediating unit is that of time. But education was also subject to a similar transformation. The cult of efficiency which so insinuated itself into the early education administration movement also objectified and commodified time through converting educative relations into

relations which were objectified, measurable and based on exchange value. Early educational administrators such as Bobbitt, Spaulding and Morrison were concerned to eliminate waste and to maximise the efficient use of time. To do this they fragmented the educative process by dividing the curriculum into units of student hours worth varying amounts of money. These administrators were part of the movement which Callahan (1962) has argued was founded on the cult of efficiency. In the next section the influence of the cult of efficiency and the recent new efficiency movement on the administration of education will be examined.

Time and the administration of education

In the previous sections of this monograph we have shown how our modern perception of time is a recent social creation. Prior to the rise of industrial capitalism, time was perceived by the great bulk of the people in a different way from what it is today. Indeed, even in many present-day societies, time is conceived of in ways that seem almost incomprehensible to those individuals socialised into the commodified, objectified view of time prevalent in western industrialised societies. So incomprehensible, to us, is any other view of time that might be held by those whose philosophical and historical precedents do not match our own, that we dismiss their lack of punctuality and time efficiency as due to laziness or ignorance (see Berger, Berger & Kellner 1973; Graham 1981). But because time efficiency holds such a powerful sway on the way we perceive the world the next part of this section will look firstly at how this social construction of reality subverted educational administration in its early development and secondly at the way in which time efficiency and time discipline manifests itself at the present time.

Time, the cult of efficiency and educational administration

The concern with time efficiency in its objectified, commodified form was not confined solely to the management of business enterprises. The administrators of schools seeking to gain status by emulating their business counterparts were also concerned with objectifying time by divorcing it from the daily lived experiences of the students within the school system. Administrators in schools in the early twentieth century aped the so-called efficiency methods and time and motion procedures which had been expounded by F. W. Taylor and his disciples. At a time when Taylor was advocating his ideas for industry Thompson (1915) exhibited a

similar interest in increasing the efficient use of school time within the education system. As well as the restructuring of the school years and the curriculum he suggested that the influence of the teacher was the key in the efficient use of school time. Thompson suggests that time could be more efficiently employed if the following criteria were held:

1 better 'condition' of pupils;
2 more definite, attractive and immediate, as well as distant goals;
3 a course of study more pertinent in content and more psychological in sequence;
4 wiser, more tactful and more human teachers;
5 a student-body more devoted and industerious as well as cheerful;
6 a complete elimination or minimization of distractions;
7 more timely beginnings in all activities;
8 more industrious prosecution of work;
9 keener competition of the pupil, with himself and with others;
10 saner refreshment and reanimation of pupils.

(Borg 1980, p. 34)

The quest for a more efficient organisation of education and the reduction of waste was also a concern of Morrison (1926). He advocated the substitution of the 'casual methods' in educational administration of the past with intensive, systematic procedures in the hands of very highly trained workers, governed and led by still more highly trained executives and boards of control (Morrison 1926, p. 680). Central to these systematic procedures was the idea that learning schedules could be arranged to ensure that there was minimum interruption to the students' routine and minimum loss of time.

Such sentiments as espoused by Thompson & Morrison were understandable at a time when Taylor's approach to the organisation of work was held in such high regard. In fact the continuous application of workers' efforts to the productive task (cf. education's time-on-task) often necessitated strict discipline. Even into the 1930s Ford workers were fined for talking on the job, while those workers who arrive more than two minutes late are still docked fifteen minutes wages in British industry (see Henderson & Cohen 1979). Influential writers on the newly emerging field of educational administration, men such as Sneddon, Bobbitt, Cubberly and Spaulding, held the belief that the general welfare of the community coincides with business manpower requirements. Consequently it was 'no wonder that schoolmen sought to emulate the efficiency of business and use whatever

methods business had used to attain it; and no wonder that "scientific management" appeared in the forefront of these methods' (Callahan 1962, p. 245).

The quest for efficiency as typified through Taylor's stop-watch and recording card was applied to schools. This thrust was directed in two directions: firstly at the school administrator who took on the guise of a business manager and secondly at the curriculum through which the raw material or children would be worked to give the finished product.

Spaulding, in particular, made it quite clear that scientific management should be applied to the administration of schools. He acknowledged that most educational administrators were well aware of Taylor's work and the successful results which were attributed to his efficiency methods. However, Spaulding was still dubious of the applicability of scientific method to some aspects of education which might be found to be immeasurable.

> As we recall the familiar stock examples of scientific management that came to us from the material industries – *such as the mining of pig iron, the laying of bricks and the cutting of metals* – as we recall the multitude of stop watch observations and experiments, the innumerable, accurate measurements and comparisons of processes and results, out of which after many years these examples have grown, we may be pardoned if we felt a *momentary doubt* of the applicability to the *education industry* of any *management* worthy to be characterised as scientific.
>
> (Callahan 1962, p. 68)

However he countered any 'momentary doubt' as to the suitability of stop-watch observation and precise measurement by stating

> let us waste no time over the obvious but fruitless objection that the ultimate and real products of a school system – those products that are registered in the minds and hearts of children that go out from the schools – are immeasurable, and hence incomparable.
>
> (Callahan 1962, p. 68)

Bobbitt attempted to solve the problem of learning by fragmenting education into units of cost per hour. The result was similar to Marx's example cited above, of how commodities could be compared by breaking them into segments of time. Bobbitt compared the practices and standards of schools in the same way as the business world compared various commodities. His basic cost unit was the student hour which was used to decide the cost per thousand hours of various subjects. He argued that if,

> satisfactory instruction in high school English can be had for fifty dollars per thousand student-hours, and ... this price represented the norm of practice, then those responsible for high-school management have a standard of judgment that can be used for measuring the efficiency of their practices. If instruction in this subject is costing them $75 per 1000 student-hours, and they are aiming at results of only the usual sort, it is evident that they are wasting money, and that administrative adjustments need to be made.
>
> (Callahan 1962, p. 161)

Time was used by educational administrators to measure and quantify student work. Also student time had become a commodity that could be bought for so many dollars. Social and educational relationships are seen through this process as cash relationships. Education is perceived as a consumer good bought for a certain amount of money over so much time. Time rather than a particular educational experience or process is being bought. Education becomes an objectification of time spent on the educative process. However as the necessary labour time is related to the value of the commodity, that is, so many dollars per thousand student hours, then the curriculum and its subjects become divisible and quantifiable in terms of units of time. Such a process results in education being based on a predominantly objective relationship with learning separated and divorced from the student and objectified through commodified units of time.

Underlying this approach to educational administration was a concern to place it on a scientific basis. People such as Bobbitt, Cubberly and Sneddon believed that educational administration was a science and that if it was to make a valuable contribution to society it had to be scientific. Snedden in particular argued that if educators were going to achieve the efficiency of the business world then their thinking had to become scientific. He felt that there would eventually develop a science of educational aims and purposes, while the science of educational method would be furnished through psychology. He believed also that any efficient educational administrative practices would be founded on scientific methods with principles coming from experiment and discovery (see Drost 1967).

Such a view of education, as we have seen above, implies a linear concept of time or, as Offe (1976), has described it in relation to work, a task-continuous perspective of time. Bobbitt exemplified this application of science to educational administration through his modifications of Taylor's principles of scientific management. He claimed that in the administration of schools:

> A first principle of scientific management is to use all the plant all the time.
> A second principle of scientific management is to reduce the number of workers to a minimum by keeping each at the maximum of his working efficiency.
> A third principle of efficient management is to eliminate waste.
> A fourth principle of general scientific management is: Work up the raw material into that finished product for which it is best adapted.
>
> (Callahan 1962, p. 132)

Bobbitt argued that by scientific study all the school plant could be constantly employed in productive use. Also he sought to maximise the utilisation of the teacher's six-hour day in a continuous task process as well as to minimise students' tasks in regular studies. But Callahan points out that neither the teacher's preparation nor the students' education ceases once they leave the classroom. The education process was conceived by educational administrators as being limited to the actual time spent in the classroom. Callahan argues that 'this misconception, which still persists in our own time, was and is one of the most harmful outcomes of the confusion of the school with the factory and of the teacher with the worker whose work is finished when the whistle blows' (Callahan 1962, p. 133).

As Callahan indicated, such a perception of time and education still exists today. Indeed it seems to be gaining strength through what Beare (1982) has termed the 'new cult of efficiency' or the 'new efficiency movement'. Apple argues that in the present education climate 'the current solution is to couple the tightening of control and accountability, reductions in spending, and closer ties between schools and industry on the one hand with the rhetoric of local control, parental choice and a "free market" individualism on the other' (Apple 1981, p. 383). Such prescriptions have been exemplified in the U.S.A. by the call of President Reagan's National Commission on Excellence in Education (1983) for the existing school to be used more effectively coupled with a longer school day, or a lengthened school year. Similarly there is the call in Australia by conservative academics such as Chipman to increase the time Australian students spend in school (see Harrold 1985), as well as the burgeoning literature dealing with time-on-task (see Denham & Lieberman 1980; Karweit 1983; Anderson 1984a). In the next section we will explore these recent examples of objectified time being applied to education.

The new efficiency movement and time-on-task

Beare (1982) has set out a number of reasons for an increasing concern with 'efficiency' and 'effectiveness' in educational administration. He claims that private industry, under the burden of inflation, has experienced decreasing profit margins which has caused a rationalisation of organisation and staffing. The resultant moves for economic and financial efficiency have led to the reduction of job opportunities, the maximisation of the productive work of the existing staff and increased selectivity when recruiting staff. Also he points out that the government sector is also being affected by inflation, increased costs and financial cut-backs. Consequently there are calls for this sector to mirror the private sector through the quest for higher 'productivity' and 'efficiency'. Lastly, the effects of inflation have led to increased resistance by taxpayers who have come to believe that they are taxed too highly. Consequently taxpayers frequently simplistically compare education with the organisation and administration of the private sector to which they are accustomed. The result is a call for comparable 'productivity', 'efficiency' and 'effectiveness' to that which they think occurs in private enterprise. In such a scenario education becomes purely instrumental with educational outcomes 'efficiently' and 'effectively' matched to corporate needs.

These moves have been paralleled by a quest for the more 'efficient' and 'effective' use of time by students in schools which might result in greater engagement on task-continuous work. Thus Berliner has recently remarked that 'many teachers can improve their effectiveness by attending to these variables and reorganizing classroom practices to maximize teaching time and learning time–resources over which they have considerable personal control' (1979, p. 134). While Berliner hopes that the end result would not give rise to authoritarian factories of learning, the language he uses and the vision that his argument conjures up seems similar to the description of modern industry as task-continuous and Downing's (1983) description of the continuous, task engagement employed in modern word-processor pools.

The present interest in time-on-task originated from the work of Carroll, particularly his 1963 paper 'Model of school learning' which seems to have had considerable influence. In a model which combined five elements there were three which had implications for time. These were time needed, time allowed and time spent on learning.

Carroll was concerned with setting out a scientific approach which would allow the prediction of success in learning tasks. In undertaking this project, Carroll put forward three basic variables

which were dependent on time. As he explains these were

> (a) 'aptitude', as reflected in the amount of time that a student would need to learn something to a specific criterion, assuming high motivation (perseverance), ample opportunity to learn and an optimal quality of instruction; (b) 'perseverance', as reflected in the amount of time that a student would be willing to engage in active learning; and (c) 'opportunity to learn', as reflected in the amount of time that the organization of a course, or other circumstances, would allow for learning.
>
> (Carroll 1984, p. 17)

As well there were two other variables: ability and quality of instruction. Carroll then developed a formula which took account of the five variables:

$$\text{Degree of learning} = f\left(\frac{\text{time actually spent}}{\text{time needed}}\right)$$

(Carroll 1963, p. 730)

Thus in similar fashion to Taylor, as we have seen above, Carroll attempted to put the relationship between time and learning on a scientific basis through the development of a mathema tical formula.

Also coming from this paper were a number of labels which have been used to relate actual engaged learning to a measurable unit of time, so we have time-on-task, engaged time and active learning time (Anderson 1984a, 1984b). Carroll acknowledges that the paper is one of his 'more influential writings'. In a reflection of the reaction to his paper he found that there were '168 citations of it listed in the volumes of the *Social Science Citation Index* over the years 1969–80, but many other references to it are to be found. Further, the article has been reprinted and translated a number of times' (Carroll 1984, p. 15). Thus it would appear that Carroll's model has been very influential in focusing attention on the part time can play in learning 'effectiveness' and school 'efficiency'. As Karweit notes, when applying the factory metaphor, perhaps unconsciously, to education, 'from a practical viewpoint of maximising school efficiency in the production of learning, time factors occupy a special, potential role' (Karweit 1983, p. 4).

Levin has critiqued studies of educational production functions as having 'failed to move beyond a relatively crude empiricism' (Levin 1980, p. 205). To argue his case he has employed the model of school learning proposed by Carroll. Keeping in mind that Carroll advocated that the important variables in learning are the quality of instruction and the time that students are exposed to instruction, Levin proposed that it is important to look critically at

three teacher components: capacity, effort and time allocation . These affect Carroll's concerns for the quality of instruction and time allowed for learning. Levin outlines these three components in the following manner:

> *Capacity* refers to the personal attributes of the teacher that can be used to provide instruction and to assist learners on any particular instruction task ... Capacity to teach is determined by such factors as basic abilities, knowledge, creativity and other personality traits, and it may be affected by the teacher's education, training and experience...
> *Effort* can be thought of as the level of energy used to convert capacity into instruction for each unit of instructional time. The greater the teaching effort, capacity being constant, the greater the quality of instructional services.
> *Time* devoted to a particular institutional task ... is obviously a crucial determinant in the Carroll model of how much will be learned.
>
> (Levin 1980, pp. 208–9)

However Levin points out that any consideration of these three must take into account how, in fact, schools are actually organised. For he argues that 'a theory of school organisation would need to take account of how schools select and train teachers with the appropriate capacities ... into a high quality of instruction, and induce them to allocate their time appropriately to the different instructional foci' (Levin 1980, p. 210). The reality of teaching relates not to an autonomous profession but to work in a complex bureaucratic organisation with time allocation, rules and materials largely chosen and decided upon by forces outside the practising teacher. ' ... the actual school setting utilizes teachers in ways that minimise their control over the instructional process' (Levin 1980, p. 213). Consequently many teachers become alienated through the bureaucratic hierarchy of control and resultant loss of autonomy which is a necessary requirement of industrial capitalism where the needs of capital accumulation give rise to production activities that 'alienate workers from each other as well as the process and result of their work activities' (Levin 1980, p. 213). In such an alienated condition teachers are less likely to be as highly committed than they would be if they were completely autonomous professionals. As a consequence unless something is done the quality of education will decline. Levin suggest that in such alienating conditions teachers' interest could be improved 'by matching them to experiences that they prefer; allocating extrinsic rewards such as pay, status, mobility, and job tenure according to institutional criteria; creating a supportive organisational climate; and providing additional training' (Levin 1980, p. 221).

Levin concludes that while recent emphasis on student learning stresses time it neglects effort and capacity. It is no use prescribing specific units of time for study if effort and capacity are wanting. But in the larger organisational framework it is assumed that the labour time purchased by capital will be transformed uniformly into labour services. However in schools regardless of attempts 'to routinize and regularize the instructional process, the actual effects are probably very diverse because of the lower level of control and internal contradictions in their operation' (Levin 1980, p. 222).

Levin in a number of recent papers (Levin 1984a, 1984b; Levin & Tsang 1984) has critiqued the place of time in the mechanistic production model of school organisation whereby fragmented time parcels are allocated to subjects, students and teachers. Advocates of the mechanistic production view see time as objectified and a commodity which can be bargained for, parcelled out and distributed via the timetable to teachers and students. The main concern is to attempt to achieve the most eonomic, cost-efficient means of producing a certain educational product.

This mechanistic view of time in the production of suitable student outputs takes the 'factory metaphor' as its basis with the school as a factory, the centre of the 'production of education'. Thomas argues, in presenting this perspective, that:

> Education will be regarded as the result of a process of production. Once we are willing to accept the notion that education is produced, we can talk about alternative methods of production. This is a great step forward; education systems are characterized by a sameness of organization and an apparent belief that there is a single 'best' method of combining resources for producing changes in the behavior of students. The acceptance of the notion that these are alternative productive methods leads to an acceptance of resource allocation as a central responsibility of administrators.
>
> (Thomas 1971, p. 3)

Time, when set in such a context, becomes ahistorical, neutral and disembowelled of its philosophical and political foundations. The economic efficiency perspective is taken-for-granted as being the 'natural' view of time, for 'neither philosophy nor politics is quite compatible with the issues'. There is more a concern 'with economic optimality than with normative issues or the political process' (Thomas, 1971, p. 76). Thomas acknowledges that as a consequence, 'there is some similarity between the ideas presented in [his own] book and those of the scientific management school' (Thomas 1971, p. 6).

Such an approach to time and its allocation neglects the rich heritage of philosophy and values which are embedded in the cultures of schools and which are exemplified by their myths, metaphors, rites, rituals and ceremonies. These forms illustrate the overreaching conception of culture which comes about through people organising (see Bates 1984; Greenfield 1980; Trice & Beyer 1984) and which are lost in mechanistic approaches to administration.

Levin argues that even within the constraints of the economic production model of schooling 'careful scrutiny suggests that the consequences of increasing time allocated to schooling and making its use more effective are hardly as straightforward or as effective in improving achievement as they have been advertised' (Levin 1984b, p. 1). Drawing on the work of Levin, Glass & Meister (1984), Levin & Tsang (1984) were concerned to examine the relationship between student time and achievement and how student decisions might impinge on the allocation of time and effort devoted to learning.

Levin, Glass & Meister (1984) had attempted to estimate the effect of achievement when an extra hour was added to the school day. The extra hour was divided equally between extra reading and extra mathematics. Using their economic model they found that the improvement in student achievement would be slight. This finding, coupled with Levin & Tsang's (1984) analysis, suggested that simplistic, mechanical increases in instructional times will result in only minimal benefits with regard to increased student achievement. A more satisfactory approach, they argue, would be to make more attractive to students both non-pecuniary and pecuniary rewards involved in schooling. Non-pecuniary rewards could be enhanced by making the administration of school less routinised and regulated and more democratic, vital and exciting with more interesting learning experiences (see Levin 1983). Pecuniary rewards are related to the labour market. The rewards available through the labour market could be enhanced through a reversal of the routinisation, deskilling and degradation of jobs and an increase in the autonomy and intellectual involvement in work. Such autonomous work is also associated with higher salaries (see Levin 1980).

Levin (1984b) concludes that an increase in student achievement might be best achieved through policies which improve the intrinsic attractions of schooling. Such an approach would mean the abandonment of the essentially mechanical, objectified approach to the perception of time in the administration of schools. This perception of time, as we have seen, is grounded

in the scientific management of industrial capitalism. Levin argues that school would become more vital, exciting and meaningful if there were 'a greater emphasis on democracy in the school setting with greater internal participation of students in selecting personnel, curriculum, resource allocation and conflict resolution. Through both representative and participatory democracy, the fuller involvement of group of students ... would become part of the educational decision process' (1983, p. 240).

Conclusion

This monograph has attempted to place our perception of time back within its historical, philosophical and political context. These considerations are avoided by mechanistic, technicist approaches to educational administration. This 'technocratic rationality' (Habermas 1971) accepts and reifies existing notions of time as 'normal' and 'natural' while also providing an ideological veil which masks the repression and domination that such formulations carry. In such a scenario technical rationality lends support to the notion of time measurement which is offered as politically and philosophically neutral. Here facts are separated from values, means separated from ends and theory separated from practice. But technical rationality not only veils a particular ideology, it also legitimates the existing organisational structures. Consequently '... the ideal of value-neutrality so central to professional objectivity and detachment ... served to justify both a *scientific* and a productive and *interventionist* approach to knowledge and knowing' (Wilson 1985, p. 131). Such an approach has been as we have seen the concern of Taylor, early educational administrators and the advocates of time-on-task.

The commodification of time within an educational setting has meant that knowledge itself has become commodified into discrete learning units which are scheduled into the daily routine of the school. Knowledge and curriculum matters are seen as technical problems to be resolved through the satisfactory allocation of competing segments of time. The result is that knowledge is offered to students in a form which is routinised, predictable, fragmented and measured by the clock. This technical view of knowledge supplants a cultural ethos of knowledge which is historical, philosophical and aesthetic and denies the totality of human knowledge (see Harris 1982).

By reflecting on time and educational administration in this monograph knowledge in schools might be seen not as isolated, framented units measured in time but rather as a totality. Through such a perspective educational administration also might be seen as

part of a larger concrete whole rather than a collection of isolated abstract considerations (Benson 1977).

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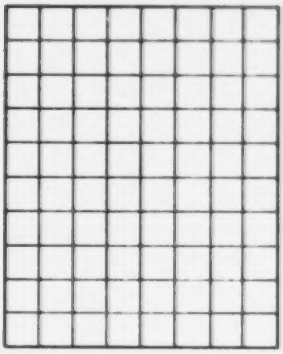
Readings



1 Reflections on the history of the concept of time

G. J. Whitrow

Source: G. J. Whitrow, 'Reflections on the history of the concept of time', *International Society for the Study of Time Conference*, vol. 1, 1972, pp. 1-11.

Summary. The central feature of our current mode of thought about the physical universe and human society is the idea of time as linear advancement without cyclical repetition. We tend to regard this idea as intuitively obvious and a necessity of thought, but a general survey of the historical evidence reveals that this is not the case.

The origins of our concept of time are shrouded in mystery, but from our knowledge of ancient civilizations and also of surviving primitive races it is reasonable to assume that the lives of our remote ancestors were far less consciously dominated by time than are ours. For example, although the children of Australian aborigines are of similar mental capacity to white children, they have great difficulty in telling the time by the clock. They can read off the position of the hands of the clock as a memory exercise but they are quite unable to relate it to the time of day. There is a cultural gap between their conception of time and ours which they find difficult to cross. Nevertheless, all primitive peoples have some idea of time and some method of reckoning, usually based on astronomical observations. The Australian aborigine will fix the time for a proposed action by placing a stone in the fork of a tree, or some such place, so that the Sun will strike it at the agreed time.

Primitive man's sense of rhythm was a vital factor in his intuition of time. Moreover, before he had any explicit idea of time, he seems to have been aware of temporal associations dividing time into intervals like bars in music. The principal transitions in nature were thought to occur suddenly, and similarly man's journey through life was visualized as a sequence of distinct stages – later epitomized in Shakespeare's 'Seven ages of man'. Even in so culturally advanced a civilization as the ancient Chinese different intervals of time were regarded as separate discrete units, so that time was in effect discontinuous. Just as space was decomposed into regions, so time was split up into eras, seasons and epochs. In other words, time was 'boxed'.[1] Even in medieval Europe the development of the mechanical clock did not spring from a desire to register

1 Study of Time

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the passage of time but rather from the monastic demand for accurate determination of the hours when the various religious offices and prayers should be said.

It was a long step from the inhomogeneity of magical time as generally imagined in antiquity and the middle ages, with its specific holy days and lucky and unlucky secular days, to the modern scientific conception of homogenous linear time. Indeed, man was aware of different times long before he formulated the idea of time itself. This distinction is particularly well illustrated by the Maya priests of pre-Columban central America, who, of all ancient peoples, were the most obsessed with the idea of time.[2] Whereas in European antiquity the days of the week were regarded as being under the influence of the principal heavenly bodies, e. g. Saturn-day, Sun-day, Moon-day etc., for the Mayas each day was itself divine. Every monument and every altar was erected to mark the passage of time. The Mayas pictured the divisions of time as burdens carried on the backs of a hierarchy of divine bearers who personified the respective numbers by which the different periods – days, months, years, decades, etc. – were distinguished. There were momentary pauses at the end of each prescribed period, for example at the end of a day, when one god with his burden (in this case representing the next day) replaced another god with his. A remarkably precise astronomical calendar was developed embodying correction formulae that were even more accurate than our present leap year *correction* which was introduced about a thousand years later by Pope Gregory XIII in 1582. Our correction is too long by 3 days in ten thousand years, whereas the corresponding Maya correction was 2 days too short in ten thousand years.[3] Despite this astonishing technical achievement, the Mayas never seem to have grasped the idea of time as the journey of one bearer and his load. Instead, each god's burden came to signify the particular omen of the division of time in question – one year the burden might be drought, another a good harvest and so on.

Unlike the Mayas, the ancient Greeks were not obsessed by the temporal aspect of things. At the dawn of Greek literature two contrasting points of view are found in Homer and Hesiod. In the *Iliad* Olympian theology and morality are dominated by spatial concepts, the cardinal sin being *hubris*, that is, going beyond one's assigned province. The whole conception, in the words of Cornford, is "static and geometrical; everything has its limited field with bounds that must not be passed."[4] In Homer's epics time is never the subject of a verb and is therefore not even personified. He was not interested in the origin of things and had no cosmogony. On the other hand, Hesiod, in his *Works and Days* gave an account of the origin of the world, but although his poem can be regarded

2 Thompson, J. Eric S.: *The Rise and Fall of Maya Civilization*. London: 1956. p. 149.
3 Morley, S. G.: *The Ancient Maya*. 2nd edn., 1947, p. 305.
4 Cornford, F. M.: *From Religion to Philosophy*. London: 1912, p. 181.

as a moralistic study based implicitly on the time concept, the word 'time' never appears in it.

Two centuries or more later the Ionian pioneers of natural philosophy in the sixth century B. C. visualised the world as a geometrical organism or a space-filling substance with a life cycle. Heraclitus, however, believed the world to be a soul involved in an endless cycle of death and rebirth, the very essence of the universe being transmutation.[5] In place of the space-like concept of *Moira* (necessity or destiny) that we find in Homer, he advocated the time-like *Way of Justice* which admits no barriers between different regions and passes through all phases of the world-cycle. A similar emphasis on time and soul characterized the Orphic religion which appears to have provided the mythical background of Pythagoreanism. According to Plutarch, when asked what Time was, Pythagoras replied that it was the soul, or procreative element, of the universe.[6]

The extent to which Pythagoras and his followers were influenced by Oriental ideas is a matter for speculation, but the Orphic theogonical conception of *Kronos* has common features with the Iranian idea of *Zurvān Akarana* (unending time), and each was in fact depicted as a multi-headed winged serpent. In her Messenger Lectures on *Time in Greek Tragedy* Jacqueline de Romilly has suggested that "tragedy was born precisely when the consciousness of time became ripe and the idea of time important"[7], and that before the fifth century B. C. and the writings of Aeschylus the idea of time was unimportant for the Greeks. This was the century when the Hellenic world was brought into violent contact with the Iranian at Marathon and Salamis. Professor de Romilly stresses that for the Greeks time was generally thought of as a threat, and not as a continued evolution. Unlike writers of our own day, no Greek author would have dreamt of writing a play about time. Although the Greeks are known to have used waterclocks in the law courts in order to limit speeches[8], there is no evidence that the performance of plays was ever restricted in this way (despite a dubious reference in Aristotle's *Poetics*). Nor did they even like to show the action of time on moods and feelings. When Euripides allowed one of his characters, Iphigeneia, to change her decision within a short time, Aristotle was shocked.[9]

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5 "Homer was wrong in saying: 'Would that strife might perish from among the gods and men', He did not see that he was praying for the destruction of the universe; for, if his prayer were heard, all things would pass away." (Heraclitus, Fragment 43, transl. Burnet, J., *Early Greek Philosophy*, 3rd ed., 1920, p. 136. The reference is to the *Iliad*, Book XVIII, line 107).

6 Plutarch. *Morals*. Rev. and corrected by W. W. Godwin. Boston: 1870. Vol. 5. Platonic Question VIII (transl. R. Brown), p. 440.

7 Romilly, J. de: *Time in Greek Tragedy*. Ithaca, N. Y.: 1968, p. 5.

8 Fyfe, W. H.: *Aristotle's Art of Poetry*. Oxford: 1940, p. 22, footnote 3.

9 Romilly, J. de: op cit., p. 25.

The general outlook of the Greeks in natural philosophy was dominated by the idea of the permanence of the *cosmos*, and in so far as they thought of time in this context they associated it with the regular alternation of things and not with concepts of progress and perpetual transformation. Even their idea of memory differed sharply from ours. They believed that through memory we do not try to grasp the past but rather we seize an eternal and divine truth.[10]

From about the middle of the fifth century B. C. many of the most acute Greek thinkers became sorely perplexed by time and sought to evade the concept as far as possible because it was difficult to reconcile with their severely rational outlook. In particular, Parmenides, the founding father of logical disputation, argued that time cannot pertain to anything that is truly real. The essence of his difficulty was that time and change imply that the same thing can have contradictory properties – it can be both red, say, and not-red depending on the time – and this conflicted with the idea that nothing can possess logically incompatible attributes.

The difficulties involved in producing a logically satisfactory theory of time were emphasized by Parmenides's pupil Zeno of Elea in his famous paradoxes. For, although these paradoxes were primarily concerned with the problem of motion, they raised difficulties both for the idea of time as continuous or infinitely divisible and for the idea of temporal atomicity. Unlike the Pythagoreans, who tended to identify the chronological with the logical, Parmenides and Zeno argued that they are incompatible.

The influence of Parmenides and Zeno on Plato is evident in the different treatment of space and time in Plato's cosmological dialogue the *Timaeus*. Space exists in its own right as a given frame for the visible order of things, whereas time is merely a feature of that order based on an ideal timeless archetype of realm of static geometrical shapes (Eternity) of which it is the 'moving image', being governed by a regular numerical sequence made manifest by the motions of the heavenly bodies. Plato's intimate association of time with the universe led him to regard time as being actually produced by the revolutions of the celestial sphere.

This conclusion was not accepted by Aristotle who rejected the idea that time can be identified with any form of motion. For, he argued, motion can be uniform or non-uniform and these terms are themselves defined by time, whereas time cannot be defined by itself. Nevertheless, although time is not identical with motion, it seemed to him to be dependent on motion. Possibly influenced by the Pythagoreans, he argued that time is a kind of number, being the numerable aspect of motion. Time is therefore a numbering process founded on our perception of 'before' and 'after' in motion: "Time is the number of motion with respect to earlier and later." Aristotle regarded time and motion as

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10 Vernant, J. P.: *Mythe et Pensée chez les Grecs, études de Psychologie Historique*. Paris: 1965 51–78.

reciprocal. "Not only do we measure the movement by the time, but also the time by the movement, because they define each other. The time marks the movement, since it is its number; and the movement the time."[11] Aristotle recognized that motion can cease whereas time cannot, but there is one motion that continues unceasingly, namely that of the heavens. Clearly although he did not agree with Plato, he too was profoundly influenced by the cosmological view of time. Moreover, although he began by rejecting any association between time and a particular motion in favour of one between time and motion in general, he came to the conclusion that time is closely associated with the circular motion of the heavens, which he regarded as the perfect example of uniform motion.

Unlike the pre-Parmenideans, Aristotle interpreted the first cause of anything not as its method of origin but as its sustaining principle. Instead of *physis* signifying the whole process of growth, it now came to mean the form of the fully developed thing. "for the process of generation exists for the sake of the complete being, and not this for the sake of the process".[12] Moreover, the order of the universe was declared to be eternal and ungenerated. Consequently, Aristotle objected to the Orphic and similar theogonies because they made the development of the world to a certain extent evolutionary. "The most perfect was not in existence at the beginning, but appeared at a later stage. In his own terms, they made the potential prior in time to the actual, and that for Aristotle was the greatest heresy."[13]

Belief in the cyclic nature of time was widespread in antiquity and found its apotheosis in the concept of the Great Year, which the Greeks may have inherited from the Babylonians. The idea had two distinct interpretations. On the one hand it was simply the period required for the Sun, Moon and planets to attain the same positions in relation to each other as they had at a given time. This appears to be the sense in which Plato used the idea in the *Timaeus*. On the other hand, for Heraclitus it signified the period of the world from its formation to its destruction and rebirth. The two interpretations were combined by the Stoics, who believed that, when the heavenly bodies return at fixed intervals of time to the same relative positions as they had at the beginning of the world, everything would be restored just as it was before and the entire cycle would be renewed in every detail. "Socrates and Plato and each individual man will live again, with the same friends and fellow citizens. They will go through the same experiences and the same activities. Every city and village and field will be restored, just as it was. And this restoration of the universe takes place not once, but over and over again – indeed to all eternity without end. Those of the gods who are not subject to destruction, having observed the

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11 Aristotle, *Physica* (transl. R. P. Hardie and R. K. Gaye) in *The Works of Aristotle* (ed. W. D. Ross) Vol. II, Oxford: 1930, Book IV, 220b.

12 Aristotle, *De Partibus Animalium*. 640a. 17–19.

13 Guthrie, W. K. C.: *Orpheus and Greek Religion*. London: 1935, p. 245.

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course of one period, know from this everything which is going to happen in all subsequent periods. For there will never be any new thing other than that which has been before down to the minutest detail."[14]

Essentially the same philosophy of time can be found in such different works as the Book of Ecclesiastes ("Is there anything whereof it may be said, See this is new? It hath been already of old time which was before us.") and Virgil's Fourth Eclogue, in which occurs the famous passage: "A second Tiphys shall then arise and a second Argo to carry chosen heroes; a second warfare too shall there be, and again a great Achilles be sent to Troy."

A cardinal factor that caused time to become a concept of primary importance was the spread of Christianity. Its central doctrine of the Crucifixion was regarded as a *unique* event not subject to repetition and so implied that time must be linear rather than cyclic. Before the rise of Christianity only the Hebrews and Zoroastrian Iranians appear to have developed any teleological conceptions of the universe or had any idea that history is progressive. The historical view of time, with particular emphasis on the non-repeatability of events was, however, the very essence of Christianity. The contrast with the Hebrew view is clearly brought out in the *Epistle to the Hebrews*, chapter 9, verses 25–6: "Nor yet that he should offer himself often, as the high priest entereth into the holy place every year with the blood of others; For then must he often have suffered since the foundation of the world; but now once in the end of the world hath he appeared to put away sin by the sacrifice of himself".

Prominent among the early Church Fathers who, in their struggles against rival doctrines competing for the spiritual conquest of the Greco-Roman world, vigorously disputed the traditional cyclical view of time was St. Augustine. In many passages, both in his *Confessions* and in *The City of God*, we find him passionately concerned with the problem of the nature of time. In the latter work he wrote: "The pagan philosophers have introduced cycles of time in which the same things are in the order of nature constantly being restored and repeated, and have asserted that these whirlings of past and future ages will go on unceasingly . . . From this mockery they are unable to set free the immortal soul, even after it has attained wisdom, and believe it to be proceeding unceasingly to false blessedness and returning unceasingly to true misery . . . It is only through the sound doctrine of a rectilinear course that we can escape from I know not what false cycle discovered by false and deceitful sages."[15]

Nevertheless, despite this emphasis on linear advance, the idea of denominating the years serially in a single era count, such as the Olympic dating from 776

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14 Nemesius, Bishop of Emesa (4th cen.) in J. von Arnim: *Stoicorum Veterum Fragmenta* II, frag. 625: transl. E. Bevan, *Later Greek Religion*. London: 1927. See also Goldschmidt, V.: *Le Système Stoicien et l'idée de Temps* Paris: 1953. p. 188. footnote 5.

15 St. Augustine, *The City of God*, Book XII, Ch. XIII (quoted in translation from Baillie, J.: *The belief in Progress*. Oxford: 1950, p. 75).

B. C. and the Seleucid from 311 B. C., did not originate in the Christian era until it was introduced by Dionysius Exiguus in 525 A. D., and the B. C. sequence extending backwards from the birth of Christ was only introduced by D. Petavius in 1627.[16] In medieval Europe, just as in medieval China and pre-Columban America, time was not conceived as a continuous mathematical parameter but was split up into separate seasons, divisions of the Zodiac, and so on, each exerting its specific influence. Despite the fact that the Incarnation was a unique event, not subject to repetition, the theory of cycles and of astral influences was accepted by most Christian thinkers down to the seventeenth century. In other words, magical time had not yet been superseded by scientific time. Throughout the whole medieval period, there was a conflict between the cyclic and linear concepts of time. The scientists and scholars, influenced by astronomy and astrology, tended to emphasize the cyclic concept. The linear concept was fostered by the mercantile class and the rise of a money economy. For, as long as power was concentrated in the ownership of land, time was felt to be plentiful and was associated with the unchanging cycle of the soil. With the circulation of money, however, the emphasis was on mobility. In other words, men were beginning to believe that "time is money" and that one must try to use it economically and thus time came to be associated with the idea of linear progress, an idea that was reinforced by religious tendencies in the Reformation.

Although medieval scholars were not concerned with machines, they became more and more interested in clocks, particularly because of their connection with astronomy. For it was generally believed that a correct knowledge of the relative positions of the heavenly bodies was necessary for the success of most earthly activities, and many early clock incorporated elaborate astronomical representations. The most celebrated was the Strasbourg clock set up in 1350, but the most elaborate was that designed by Giovanni de'Dondi of Padua between 1348 and 1364.[17] His famous contemporary Nicole Oresme likened the universe to a vast mechanical clock created and set moving by God so that 'all the wheels move as harmoniously as possible'.[18]

The great leaders of the scientific revolution of the seventeenth century were also much concerned with horological questions and metaphors. Early in the century Kepler specifically rejected the old quasi-animistic magical conception of the universe and asserted that it was similar to a clock, and later the same analogy was drawn by Robert Boyle and others. Thus the invention of the mechanical clock played a central role in the formulation of the mechanistic conception of nature that dominated natural philosophy from Descartes to Kelvin. An even more far-reaching influence has been claimed for the mechanical

16 Bickerman, E. J.: *Chronology of the Ancient World*. London: 1968, p. 10.

17 Bedini, S. A., Maddison, F. R.: *Mechanical Universe – the Astrarium of Giovanni de Dondi*. Trans. Am. Phil. Soc. 56, Part 5 (1966) 5–69.

18 White, L. Jr.: *Medieval Technology and Social Change*. Oxford: 1962, p. 125.

clock by Lewis Mumford who has argued that it "dissociated time from human events and helped to create the belief in an independent world of mathematically measurable sequences: the special world of science."[19]

Moreover, the invention of a satisfactory mechanical clock had a tremendous influence on the concept of time itself. The oldest modes of timekeeping were essentially discontinuous. For, instead of depending on a continuous succession of temporal units, they merely involved the repetition of a concrete phenomenon occurring within a unit – as, for example, where Homer in the Twenty-first Book of the *Iliad*, makes one of Priam's sons say to Achilles "This is the twelfth dawn since I saw Ilion." Even the sundials, sandreckoners and waterclocks of antiquity tended to be more or less irregular in their operation. It was not until a successful pendulum clock was invented by the Dutch scientist Christiaan Huygens in the middle of the seventeenth century that man was at last provided with an *accurate* timekeeper that could tick away continually for years on end. This must have greatly influenced belief in the homogeneity and continuity of time.

These characteristics were implicit in the idea of time put forward by Galileo in the dynamical part of his book *Two New Sciences*, published in 1638. Although he was not the first to represent time by a geometrical straight line, he became the most influential pioneer of this idea through his theory of motion. Nevertheless, for the first explicit discussion of the concept of geometrical time it seems that we must go to the *Geometrical Lectures* of Isaac Barrow written about thirty years after the publication of Galileo's book. Barrow, who occupied the chair of Mathematics in Cambridge in which he was succeeded by Newton in 1669, was much impressed by the kinematic method in geometry that had been developed with great effect by Galileo's pupil Torricelli. He realized that to understand this method it was necessary to study time, and he was particularly concerned with the relation of time and motion. "Time does not imply motion, as far as its absolute and intrinsic nature is concerned; not any more than it implies rest; whether things move or are still, whether we sleep or wake, Time pursues the even tenour of its way."[20] However, he argues, it is only by means of motion that time is measurable. "Time may be used as a measure of motion; just as we measure space from some magnitude, and then use this space to estimate other magnitudes commensurable with the first; i.e. we compare motions with one another by the use of time as an intermediary." He regarded time as essentially a mathematical concept which has many analogies with a line "for time has length alone, is similar in all its parts and can be looked upon as constituted from a simple addition of successive instants or as from a continuous flow of one instant; either a straight or a circular line". The reference here to "a circular line" shows that Barrow was not completely

19 Mumford, L.: *Technics and Civilization*. London: 1934. p. 15.

20 Barrow, I.: *Lectiones Geometricae* (transl. E. Stone). London: 1735, Lect. 1, p. 35.

emancipated from traditional ideas. Nevertheless, his statement goes further than any of Galileo's, for Galileo only used straight line *segments* to denote particular intervals of time. Barrow was very careful, however, not to push his analogy between time and a line too far. Time, in his view, was "the continuance of anything in its own being."

Barrow's views greatly influenced his illustrious successor, Isaac Newton. In particular, Barrow's idea that, irrespective of whether things move or are still, whether we sleep or wake, "Time pursues the even tenour of its way" is echoed in the famous definition at the beginning of Newton's *Principia*: "Absolute, true and mathematical time, of itself, and from its own nature, flows equably without relation to anything external."

Newton's views, in turn, made a great impression on the philosopher John Locke. In his famous *Essay concerning Human Understanding* (1690), we find the clearest statement of the scientific conception of time that was evolved in the seventeenth century: "duration is but as it were the length of one straight line extended *in infinitum*, not capable of multiplicity, variation or figure, but is one common measure of all existence whatsoever, wherein all things, whilst they exist equally partake. For this present moment is common to all things that are now in being, and equally comprehends that part of their existence as much as if they were all but one single being; and we may truly say, they all exist in the same moment of time."[21]

Thus by the end of the seventeenth century we seem to have arrived at the idea of time that dominated physical science until the advent of Einstein's special theory of relativity – an idea that can be baldly summarized in the symbol t denoting the continuous independent variable of classical dynamics. But the revolution in human thought that this idea implied took effect only gradually and traditional ideas lingered for a long time. For example, even Newton himself adhered to the old cyclical conception of the cosmos based on the conviction that the world was coming to an end. He was convinced that the comet of 1680 had just missed hitting the Earth and in his commentaries on *Revelations* and the *Book of Daniel* he indicated that the end of the world could not be long delayed. Robert Boyle too believed that "the present course of nature shall not last always, but that one day this world, or at least, this vortex of ours, shall either be abolished by annihilation, or, which seems far more probable, be innovated, and, as it were transfigured, and that, by the intervention of that fire, which shall dissolve and destroy the present frame of nature."[22]

The symbol t in Newtonian dynamics carries no arrow, for the equations of motion are unaltered by a reversal in the direction of time. Only with the

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21 Locke, J.: *Essay concerning Human Understanding*. 1690, Book II, Chapter 15, Paragraph 11.

22 Boyle, R.: *The Excellence of Theology compared with Natural Philosophy*. (1665). London: 1772. p. 11.

rise of thermodynamics in the nineteenth century did the problem of this direction enter physics. Nevertheless, the concept of linear progress in history was the concomitant of the rise of modern science, particularly as prognosticated by Francis Bacon, one of whose works, dating from 1603, bore the significant title *Temporis Partus Masculus (The Masculine Birth of Time)*. In this he wrote: "Science is to be sought from the light of nature, not from the darkness of antiquity. It matters not what has been done; our business is to see what can be done."[23] The scornful rejection by Bacon of the doctrine that the ancients had encompassed all knowledge was echoed by, among others, John Wilkins, who, in 1638, in *The Discovery of a New World* – in which he attempted to show that the Moon is inhabited – wrote: "there are yet many secret Truths which the Ancients have passed over, that are yet left to make some of our Age famous for their Discovery." And, two years later, in his *A Discourse Concerning a New Planet*, in which he advocated the Copernican theory, he wrote, even more significantly for our purpose: "Antiquity does consist in the Old Age of the World, not in the Youth of it. In such learning as may be increased by fresh Experiments and new Discoveries; 'tis we are the Fathers, and of more Authority than former Ages; because we have the advantage of more Time than they had, and Truth (we say) is the Daughter of Time."[24] The spirit of optimism with which, as the seventeenth century progressed, men came to regard the possible achievements of scientists was ecstatically expressed by Henry Power in his *Experimental Philosophy* (1664): "the Solutions of all those former Difficulties are reserved for you (most noble Souls, the true lovers of Free and Experimental Philosophy) to gratifie Posterity withall. You are the enlarged and Elasticall Souls of the world who, removing all former rubbish, and prejudicial resistances, do make way for the Springy Intellect to flye out into its desired Expansion. When I seriously contemplate the freedom of your Spirits, the excellency of your Principles, the vast reach of your Designs, to unriddle all Nature; me-thinks, you have done more than men already, and may be well placed in a rank Specifically different from the rest of groveling Humanity."[25]

The influence of the scientific revolution of the seventeenth century on the change in men's attitude to time, by directing attention away from the past, with its cyclical assumptions, to the future, with its prospect of linear advancement, has not so far been treated with the attention to detail that its importance merits. Although the spirit of philosophical optimism that this change encouraged took a severe knock from the great Lisbon earthquake of 1755, the eighteenth century enlightenment continued to develop on the basis of the new forward-looking view of time. Moreover, in this same century leaders of thought finally abandoned the biblical chronology that excluded the possibility

23 Farrington, B.: *The Philosophy of Francis Bacon*. Liverpool: 1964, 69.
24 Wilkins, J.: *Mathematical and Philosophical Works*. 1708, p. 146.
25 Power, H.: *Experimental Philosophy*. 1664, p. 191.

of slow processes of transformation over immense periods of time. In his *Theory of the Earth*, first published in 1785, the geologist James Hutton declared "We find no vestige of a beginning – no prospect of an end."

The linear view of time as continual progression finally prevailed through the influence of the nineteenth century biological evolutionists. Meanwhile, everyday life, at least in the countries influenced by European and American technical developments, tended to become more and more subservient to the tyranny of time. "The clock", as Lewis Mumford rightly declares, "not the steam-engine, is the key-machine of the modern industrial age."[26] The popularization of time-keeping that followed the mass-production of cheap watches in the nineteenth century accentuated the tendency for even the most basic functions of living to be regulated chronometrically: "one ate, not upon feeling hungry, but when prompted by the clock: one slept, not when one was tired, but when the clock sanctioned it."[27] This regulation of our lives by the clock meant that the abstract concept of absolute time as something existing in its own right came to be endowed with a spurious concrete reality. Even the division of the Earth's surface, in 1885, into separate time-zones did little to undermine this widespread belief. When, in 1916, daylight saving (now called British Standard Time) was first introduced in the United Kingdom, the popular novelist Marie Corelli was not the only one who was scandalized by this hubristic interference with what she called 'God's Own Time'! But before we preen ourselves on being above that sort of nonsense, let us not forget that Einstein's penetrating criticism, in 1905, of the classical concept of universal simultaneity that precipitated the final downfall of Newtonian absolute time was at first rejected out of hand by many leading scientists and most philosophers.

Our idea of time as linear advancement without cyclical repetition is the central feature of our current mode of thought about the nature of things. It is a sophisticated concept and, as the historical evidence reveals, it is far from being a necessity of thought. The fact that we have, nevertheless, an ingrained tendency to regard our concept of time as intuitively obvious, and therefore presumably less worthy of detailed consideration than other apparently more exciting and contentious topics, may help to account for the curious fact that this in the first international conference devoted to the study of time in all its aspects.

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26 Mumford, L., *op. cit.*, p. 14.
27 Mumford, L., *op. cit.*, p. 17.

2 A model of school learning

J. B. Carroll

Source: J. B. Carroll, 'A model of school learning', *Teachers College Record*, vol. 64, 1963, pp. 723–33.

THE PRIMARY JOB of the educational psychologist is to develop and apply knowledge concerning why pupils succeed or fail in their learning at school, and to assist in the prevention and remediation of learning difficulties.

This job is inherently difficult because behavior is complex and has a multiplicity of causes. To deal with it, educational psychologists have evolved a number of concepts which they find useful in classifying the phenomena of behavior. Textbooks in the field are commonly organized around such concepts as maturation, individual differences, learning, thinking, motivation, and social development. These are useful categories, but because they overlap or refer to different levels of organization in the subject matter, it is difficult to build them into an integrated account of the process of school learning. What is needed is a schematic design or conceptual model of factors affecting success in school learning and of the way they interact. Such a model should use a very small number of simplifying concepts, conceptually independent of one another and referring to phenomena at the same level of discourse. It should suggest new and interesting research questions and aid in the solution of practical educational problems. With the aid of such a framework, the often conflicting results of different research studies might be seen to fall into a unified pattern.

Many such formulations, perhaps, are possible. A conceptual model will be presented here that seems to have the advantage of comprehensiveness combined with relative simplicity. The model is amenable to elaboration, but for our immediate purposes, we will leave aside any such elaborations.

Scope of the Model

We need first to define *learning task*. The learner's task of going from ignorance of some specified fact or concept to knowledge or understanding of it, or of proceeding from incapability of performing some specified act to capability of performing it, is a learning task. To call it a task does not necessarily imply that the learner must be aware *that* he is supposed to learn or be aware of *what* he is supposed to learn, although in most cases it happens that such awarenesses on the part of the learner are desirable.

Most, but not all, goals of the school can be expressed in the form of learning tasks or a series of such tasks. Teaching the child to read, for example, means to teach him to perform certain acts in response to written or printed language.

Examples of other learning tasks taught in the schools can be multiplied at will: learning to spell all the words in common use, learning to perform certain operations with numbers, learning to explain or otherwise demonstrate an understanding of the subject matter of biology, learning to speak a foreign language, learning to perform in competitive sports, and learning to carry out certain responsibilities of a citizen. Some of these tasks are very broadly defined, such as learning to read printed English, but we can also consider narrowly defined tasks like mastering the content of Lesson 20 in a certain textbook of French, or even mastering a certain grammatical construction covered in that lesson. The model presented here is intended to apply equally well to all such tasks, no matter how broad or narrow. It is required, however, that the task can be unequivocally described and that means can be found for making a valid judgment as to when the learner has accomplished the learning task —that is, has achieved the learning goal which has been set for him.

It will be seen that as many as possible of the basic concepts in the model are defined so that they can be measured in terms of *time* in order to capitalize on the advantages of a scale with a meaningful zero point and equal units of measurement. An effort is made to provide for a mathematical description of the degree to which a learning task is achieved. Although the model applies only to one learning task at a time, it should be possible in principle to describe the pupil's success in learning a series of tasks (*e.g.*, all the work of the fifth grade) by summating the results of applying the model successively to each component task.

The model is admittedly oversimplified. The assumption that the work of the school can be broken down into a series of learning tasks can be called into question. In actual school practice, the various tasks to be learned are not necessarily treated as separate and distinct, and the process of teaching is often organized (whether rightly so or not) so that learnings will take place "incidentally" and in the course of other activities. Nevertheless, a conceptual model requires certain simplifying assumptions, and the assumption of discrete learning tasks is a useful one to make.

The model can be regarded as applying even to those educational goals ordinarily formulated in terms of "transfer"—that is, the ability to apply in a "new" situation something learned previously. The concept of the learning task is defined to include the attainment of that degree of competence which will make "transfer" essentially as automatic as demonstration of performance in the original setting. "Transfer," correctly viewed, is a term in a metalanguage which states the conditions under which particular learnings occur or manifest themselves. Thus, when we say that "learning which occurred in situation A transfers to situation B," we are really saying that "something learned in situation A also manifested itself in situation B, there being sufficient commonality between the two situations to elicit the learned performance in both."

The model is not intended to apply, however, to those goals of the school which do not lend themselves to being considered as learning tasks. Such, for example, are those goals having to do with attitudes and dispositions. Educating a child so that he has tolerance for per-

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sons of other races or creeds, respect for parental or legal authority, or attitudes of fair play, is thought to be largely a matter of emotional conditioning or of the acquisition of values and drives. Learning tasks may indeed be involved in the cognitive support of such attitudes (as where the child learns facts about different races or creeds), but the acquisition of attitudes is postulated to follow a different paradigm from that involved in learning tasks. Perhaps the distinctions made by Skinner (*6*) are of use in this connection: We could say that whereas learning tasks typically involve "operants," the attitudinal goals of education typically involve "respondents."

Overview of the Model

Briefly, our model says that the learner will succeed in learning a given task to the extent that he spends the amount of time that he *needs* to learn the task. The terms of this statement, however, require special definition, explication, and interpretation if the statement is to be properly understood.

First, it should be understood that "spending time" means *actually spending time on the act of learning*. "Time" is therefore not "elapsed time" but the time during which the person is oriented to the learning task and actively engaged in learning. In common parlance, it is the time during which he is "paying attention" and "trying to learn."

Second, there are certain factors which determine how much time the learner *spends* actively engaged in learning.

Third, there are certain factors which determine how much time a person *needs to spend* in order to learn the task. These factors may or may not be the same as, or associated with, those which influence how much time he spends in learning.

The major part of this article is devoted to a presentation of the factors conceived as determining the times needed or actually spent in the course of a learning task and the way in which these factors interact to result in various degrees of success in learning. Four of these factors are convenient intervening variables or constructs which may, in turn, be regarded as functions of still other factors or variables; one, however, is in principle a directly manipulable and measurable factor ("opportunity").

This model of school learning should not be confused with what is ordinarily called "learning theory," that is, with the exact scientific analysis of the essential conditions of learning and the development of systematic theory about this process. Rather, the model may be thought of as a description of the "economics" of the school learning process; it takes the fact of learning for granted.

The five factors or variables in the model will be presented under two headings: (1) determinants of time needed for learning, and (2) determinants of time spent in learning.

Time Needed in Learning

Aptitude. Suppose that a randomly selected group of children is taught a certain learning task by a teacher (or teaching device) with the best possible teaching techniques. Suppose further that each child is willing to stick attentively with the learning task for the number of minutes, hours, or days required for him to learn it to the specified criterion of success, and that each child is in fact given the opportunity to do this. Common experience, as well as abundant research evidence, suggests that the amounts

of time needed by the children even under these ideal conditions will differ widely. Let us think, then, of the amount of time the pupil will need to learn the task under these conditions as the primary measure of a variable which we shall call his *aptitude for learning this task*. In ordinary parlance, learners who need only a small amount of time are said to have high aptitude; learners who need a large amount of time are said to have low aptitude. Some learners, it may be, will never learn even under these optimal conditions; we may say that these learners would need an indefinitely large (or an infinite) amount of time to learn the task.

It will be noted that this variable is measured in the opposite direction from the usual way of measuring aptitude—the shorter the time needed for learning, the higher the aptitude.

Furthermore, it will be noted that the measure of aptitude is specific to the task under consideration. Aptitude may be regarded as a function of numerous other variables. For one thing, it may depend upon the amount of prior learning which may be relevant to the task under consideration. A learner who has already progressed far towards the mastery of a task may not need much time to complete his learning. On the other hand, aptitude may also depend upon a series of traits or characteristics of the learner which enter into a wide variety of tasks; whether these traits can be accounted for solely on the basis of generalized prior learnings, or whether they reflect genetically determined individual characteristics, is of no immediate concern here. It may be useful, however, to conceive that a learner's estimated needed time, a_t, for learning a given task, t, may be written as a mathematical function of a series of basic aptitudes, symbolized with Greek letters and subscripts, minus the amount of time, s_t, saved by virtue of prior learnings relevant to the task. Thus:

$$a_t = f(\alpha_1, \alpha_2, \ldots, \alpha_n) - s_t$$

The exact form of this formula would vary for different tasks. Presumably, the basic aptitudes $\alpha_1, \alpha_2, \ldots, \alpha_n$ could be measured with considerable exactitude by appropriate tests.

Ability to understand instruction. We find it useful to postulate as a variable separate from those we consider under "aptitude" the ability to understand instruction, since this variable (in contrast to pure aptitude variables) is thought of as interacting with the method of instruction in a special and interesting way. The ability to understand instruction could be measured, one would suppose, as some combination of "general intelligence" and "verbal ability"; the former of these two would come into play in instructional situations where the learner is left to infer for himself the concepts and relationships inherent in the material to be learned, rather than having them carefully spelled out for him, while the latter would come into play whenever the instruction utilized language beyond the grasp of the learner. The way in which ability to understand instruction is postulated to interact with the type of instruction will be explained after we introduce a third variable affecting time needed for learning, the *quality of instruction*.

Quality of instruction. One job of the teacher (or any person who prepares the materials of instruction) is to organize and present the task to be learned in such a way that the learner can learn it as rapidly and as efficiently as he is able.

This means, first, that the learner must be told, in words that he can understand, what he is to learn and how he is to learn it. It means that the learner must be put into adequate sensory contact with the material to be learned (for example, one must insure that the learner will adequately see or hear the materials of instruction). It also means that the various aspects of the learning task must be presented in such an order and with such detail that, as far as possible, every step of the learning is adequately prepared for by a previous step. It may also mean that the instruction must be adapted for the special needs and characteristics of the learner, including his stage of learning. All these things may be summarized in what we call *quality of instruction*. This variable applies not only to the performance of a teacher but also to the characteristics of textbooks, workbooks, films, teaching-machine programs, etc.

Now, if the quality of instruction is anything less than optimal, it is possible that the learner will need more time to learn the task than he would otherwise need. Some learners will be more handicapped by poor instruction than others. The extent of this handicap is conceived to be a function of the learner's *ability to understand instruction*. Learners with high ability in this respect will be able to figure out for themselves what the learning task is and how they can go about learning it; they will be able to overcome the difficulties presented by poor quality of instruction by perceiving concepts and relationships in the teaching materials which will not be grasped by those with lesser ability.

For the purposes of this conceptual model, we shall say that the amount of time actually needed by a person to learn a given task satisfactorily is a function not only of aptitude (as defined previously), but also of the quality of instruction in so far as it is less than optimal. And the amount of additional time he will need is an inverse function of his ability to understand instruction.

We could, of course, apply Occam's razor and get rid of both of the two preceding variables by conceiving that a change in the quality of instruction causes an essential change in the learning task itself. In this case, we would deal only with a learner's aptitude for learning a given task, subscripted with the quality of instruction attached to it. Such a modification of our model seems undesirable, however, for one would tend to lose sight of instructional quality as one of the important manipulable variables in educational psychology.

Time Spent in Learning

Time allowed for learning ("opportunity"). It may come as a surprise to some to be told that the schools may allow less than adequate time for learning any task, but second thought will make one realize that this is very often the case. It is partly a consequence of the very large amount of material that the schools are expected to teach; the available time must somehow be distributed among many things. And it is partly a consequence of the very great variation that exists in the amounts of time that children *need* for learning, even under a good quality of instruction, and particularly when the instructional quality is such that many children of lower ability to understand instruction require much more time than they might otherwise need.

The school responds to differences in

learning rates (for that is what differences in aptitude are) in many ways. Sometimes the policy of the school is, in effect, to ignore these differences; a certain amount of time is provided for everybody to learn, and no more. (For example, at some military academies, study time is prescribed and scheduled uniformly for all cadets.) At the opposite extreme is the case where each student is allowed to proceed exactly at his own rate; private instruction in music or foreign languages and self-instruction by teaching machine or other means are approximations to this case. The middle position is occupied by learning situations in which there is some kind of "ability grouping": Pupils are assigned to different groups, classes, or curricula on the basis of estimated learning rates.

Even when there is some constraint upon the amount of time "officially" provided for learning, teachers and instructional programs vary in the amount of time they allow for learning. Some programs present material at such a rapid pace that most students are kept under continual pressure; only the apter students can keep up with this instruction, while the others fall back or out, sometimes never to get caught up. In other programs, the instruction is paced for the benefit of the slower student. The faster student is fortunate if the teacher takes appropriate steps to "enrich" his instructional content; but this will not always happen, and it is undoubtedly the case that many fast learners lose some of their motivation for learning when they feel that their time is being wasted or when they are not kept at the edge of challenge.

Perseverance

Obviously, failure to allow enough time for learning produces incomplete learning. If a person needs two hours to learn something and is allowed only one hour, and if we assume that learning proceeds linearly with time, the degree of learning is only 50 per cent. Probably one of the most aversive things which a school can do is not to allow sufficient time for a well-motivated child to master a given learning task before the next is taken up. Children meet such frustrations by indifference or the more extreme avoidance reactions and are, in any case, handicapped in undertaking the next task.

The time the learner is willing to spend in learning ("perseverance"). The term *perseverance* is used here, rather than persistence, because of the somewhat pejorative connotations of the latter. Nevertheless, the concept is similar to what Paul Brandwein describes in the following passage:

> The characteristics grouped under the Predisposing Factor . . . include a spectrum of traits which the writer places under the head of *Persistence*. This is defined as consisting of three attitudes. (1) A marked willingness to spend time, beyond the ordinary schedule, in a given task (this includes the willingness to set one's own time schedules, to labor beyond a prescribed time, such as nine to five). (2) A willingness to withstand discomfort. This includes adjusting to shortened lunch hours, or no lunch hours, working without holidays, etc. It includes withstanding fatigue and strain and working even through minor illness, such as a cold or a headache. (3) A willingness to face failure. With this comes a realization that patient work may lead to successful termination of the task at hand (*1*, pp. 9-10).

But the variable of perseverance applies not only in the case of the "gifted student" and not only in the case of long durations of effort, but also to all other learners and also to learning tasks which require only short times for mastery. That is, in the general case, a learner who (in view of his aptitude, the quality of the instruction, and his ability to understand the instruction) needs a certain amount of time to learn a task may or may not be willing to persevere for that amount of time in trying to learn. It is not a matter of his predicting how long he will be willing to learn: we simply postulate that there is a certain time over and above which he will not continue active learning of a task, and this time may lie anywhere on the scale from zero to infinity. The learner may not be motivated to learn at all, or he may regard the task as something too difficult for him to learn; in either case, he may spend no time at all in trying to learn. He may start to learn and later become distracted or bored, or he may lose confidence in his ability. He may go far toward mastery and then overestimate his achievement, thus prematurely terminating his efforts to learn. He may, of course, be so highly motivated that he would be willing to spend more time than he needs in order to reach a specified criterion of mastery. Nevertheless, for the purposes of our conceptual model, it will be assumed that the learner will never actually spend more time than he needs to master the task as defined, that is, that he will stop learning as soon as he has mastered the learning task. (In this way we avoid, for the present, the necessity of incorporating a concept of "overlearning" in the model.)

This variable, which may be called *perseverance-in-learning-to-criterion*, is thus measured in terms of time, and if it is not sufficiently great to allow the learner to attain mastery, it operates in our conceptual model to reduce the degree of learning. Assume, as before, that learning proceeds as a linear function of time. Then if a child needs two hours to learn something, is allowed one hour, but will persevere only thirty minutes, the degree of learning is only 25 per cent. Perseverance-in-learning is measured only in terms of the amount of time the child is actively engaged in learning; a child who is actively engaged in learning for various periods totaling only thirty minutes during an hour is presumably not paying attention to learning for the other thirty minutes, and this time is not counted.

Perseverance-in-learning is itself a function of many other variables which will not be separately treated in this conceptual model. It is a function partly of what is ordinarily called "motivation" or desire to learn. But there are many reasons for desiring to learn a given thing: To please the teacher, to please one's parents or friends, to get good grades or other external rewards, to achieve self-confidence in one's learning ability, to feed one's self-esteem, to avoid disapproval—all these can operate *in place of* or *in addition to* any incentives for learning which may derive from the intrinsic interest or perceived utility of the thing being learned. And there are probably just as many reasons which one may adopt (consciously or unconsciously) for *not* learning: to avoid the responsibilities which learning brings, to avoid the exertion of learning, to behave consistently with one's image of oneself as a non-

learner, or to avoid wasting time on learning tasks of no perceived importance.

Perseverance-in-learning may also be a function of what are ordinarily called emotional variables. One may desire to learn but be unable to endure frustrations caused by difficulties in the learning task or distractions from external circumstances. It may also interact with the quality of instruction; poor quality of instruction may reduce perseverance-in-learning even beyond the toll it takes in wasted minutes or even weeks.

The Complete Model

It will be noticed that the model involves five elements—three residing in the individual and two stemming from external conditions. Factors in the individual are (1) aptitude—the amount of time needed to learn the task under optimal instructional conditions, (2) ability to understand instruction, and (3) perseverance—the amount of time the learner is willing to engage actively in learning. Factors in external conditions are (4) opportunity—time allowed for learning, and (5) the quality of instruction—a measure of the degree to which instruction is presented so that it will not require additional time for mastery beyond that required in view of aptitude.

Three of the factors are expressed purely in terms of time. If ability to understand instruction corresponds to a combination of general and verbal intelligence, it can be assessed in relative terms by currently available measuring devices. The most elusive quantity in this model is that called *quality of instruction*, but both it and the ability to understand instruction are interconnected with temporally measurable variables in such a way that by appropriate experimental manipulations, they could eventually be indexed in terms of time. Temporarily, let us put quality of instruction on a scale from 0 (poor) to 1 (optimal), and ability to understand instruction on a standard score scale with mean = 0 and $\sigma = 1$.

The five factors can be worked into a tentative formula which expresses the degree of learning, for the ith individual and the tth task, as a function of the ratio of the amount of time the learner actually spends on the learning task to the total amount he needs. Thus:

$$\textit{Degree of learning} = f\left(\frac{\textit{time actually spent}}{\textit{time needed}}\right)$$

The numerator of this fraction will be equal to the *smallest* of the following three quantities: (1) opportunity—the time allowed for learning, (2) perseverance—the amount of time the learner is willing to engage actively in learning, and (3) aptitude—the amount of time needed to learn, increased by whatever amount necessary in view of poor quality of instruction and lack of ability to understand less than optimal instruction. This last quantity (time needed to learn after adjustment for quality of instruction and ability to understand instruction) is also the denominator of the fraction. It is not necessary or worthwhile here, however, to pursue the detailed mathematical formulation, which has been given elsewhere (3).

As an illustration of the usefulness of this model in clarifying other educational concepts, let us see how it provides a framework for interpreting the notion of "underachievement" as criticized by

Henry Dyer (4). While we are at it, let us also look at the notion of "overachievement." It is our contention that these terms are useful and salvageable if properly defined.

Underachievement and overachievement, like underweight and overweight, are ordinarily taken with reference to some norm or baseline of expectation. The underachiever does poorer than we expect him to, and the overachiever does better than we expect him to. The issue is this: Upon what do we base our expectation? The approved manner of doing this is to make predictions from those tests or other measurements which in fact yield the best predictions of success, and statistical theory tells us how to make best use of these predictors (*i.e.*, by making our predictions along a regression line). There is, however, a paradox here. Suppose our predictions were perfect: Then there would be no "underachievers" and no "overachievers." An unlikely eventuality to be sure! Nevertheless, our intuitive rejection of the case of perfect prediction lends credence to the following analysis of what we mean by "underachievement": Underachievement is a situation in which there is a discrepancy between actual achievement and that expected on the basis of a certain *kind* of evidence—evidence concerning the "capacity" or "aptitude" of the individual to achieve in a particular context. Such evidence is recognized as being quite distinct from evidence concerning other factors in achievement, *e.g.*, "motivation," "opportunity for learning," etc., and these latter factors would not figure in forming our expectations. Instead, we would hope to gather as much evidence as possible concerning the "capacity" or "aptitude" of the individual, defined as his learning rate when all other factors are optimal.

Achievement and Expectancy

With reference to the conceptual model presented earlier, our expectation of an individual's achievement in a given learning task would in the strictest sense be that which he would attain when he spends all the time he needs—that is, when the ratio of the time spent to the time needed is unity. Anything less than this is, to some degree, underachievement. From this point of view, *all* learners are underachievers unless they are superhuman beings in an ideal world. Perseverance sometimes flags; the quality of instruction is seldom optimal, and time allowed for learning is not always sufficient.

Let us, therefore, strike some sort of average for perseverance, instructional quality, and opportunity for learning. Our expectation of the degree of learning will be somewhat less than unity because, on the average, individuals will spend less time in learning than they need. And we may gauge underachievement and overachievement with reference to this expectation. In effect, this is what we do by the customary regression techniques based on aptitude measures, although in a less precise way than might be done if we were able to measure each of the components of achievement as stated by the model. In the framework of the model, however, underachievement is now seen to be a state of affairs which results whenever perseverance is less than some "reasonable value," whenever the quality of instruction is poor, whenever time allowed for learning has not been sufficient, or whenever some combination of these conditions has occurred. "Over-

achievement," contrariwise, may occur when there is an especially favorable combination of attendant events: high perseverance, instruction of high quality, or ample opportunity for learning.

We have a feeling about the relative amenability of different factors in achievement to manipulation or treatment: "Aptitude" is regarded as relatively resistant to change, whereas it is the hope of the psychologist that he can readily intervene to modify "perseverance," "quality of instruction," or "opportunity for learning." To some extent, this feeling is justified not only by logic but also by research findings—by the research on the apparent constancy of the IQ, on the effect of various instructional variables, etc. On the other hand, if aptitude is largely a matter of prior learnings, it may be more modifiable than we think, whereas, conversely, some kinds of clinical findings suggest that motivational characteristics of the individual may be much harder to change than one might think. These considerations, however, need not detract from the basic utility of the concepts of underachievement and overachievement. The concept of "underachievement" does not automatically imply the possibility of remediation any more than the concept of illness does. Some patients never get well, and some underachievers remain underachievers.

Babies and Bathwater

Henry Dyer (*4*) has drawn attention to possible dangers in the concept of underachievement—for example, the dangers of making predictions from unreliable or invalid predictors, of assuming that ability is innate or fixed, of making unwarranted inferences from school marks, and of overlooking determinants of school performance which are external to the pupil. Nevertheless, in suggesting that we kill the notion of underachievement, it would seem that he wants to throw out the proverbial baby with the bathwater. The concepts of underachievement and of overachievement are meaningful from both a statistical and a clinical point of view, as shown by the many fruitful studies of "underachieving" groups of students (*e.g.*, *5*). Careful attention to the elements of the conceptual model presented here will afford a safeguard against misuse of the concepts: Aptitude must be estimated by relevant and reliable measures (in actuality, all of them measures of past performance); the degree of learning must be accurately appraised, and the possible role of instructional variables must be considered. Above all, the variable which we have called *perseverance* must be validly assessed; the most direct evidence concerning it, our model would suggest, would come from observations of the amount of time the pupil actively engages in learning.

Before leaving this topic, let us consider another way in which the term "overachievement" is sometimes used. When a person is designated as an overachiever, it is often implied that his achievements derive more from his perseverance than from his aptitude or his intelligence. In terms of our model, this can occur when the learning task can be broken down into a series of subtasks of varying difficulty with difficulty roughly gauged in terms of average learning time. Because of his great perseverance, the overachiever masters to a criterion more of the *easy* tasks—tasks which are within

the compass of his aptitude—than the student of average perseverance. While he may fail to learn some of the more difficult tasks, the net result may be a high score on an achievement test—a score considerably higher than predicted from aptitude measures. This concept of overachievement is distinctly different from the concept of overachievement suggested previously; responsible users of the term must clearly state which of these meanings they intend.

Future Research

Our conceptual model could lead, it would seem, to almost endless possibilities for research. It should provoke renewed effort to develop measures of each of the basic variables included in the model. The measurement of *aptitudes* is a fairly well advanced art, although the exact ways in which these aptitudes are relevant to school learning tasks remain to be worked out. The same remark may be made about the measurement of *ability to understand instruction*. But measurements of *perseverance* and of *instructional quality* are practically nonexistent. It should be intriguing to attempt to provide a general way of measuring *opportunity to learn*, that is, the actual time available to individual students to learn in view of the pacing of instruction; for it is our hypothesis that variations in the pacing of instruction have remained largely unrecognized in pedagogical discussions.

Research is also needed on the interactions of the several variables in the model. Is the model correctly put together? To what extent are the variables interdependdent? For example, how does instructional quality affect perseverance? In what way is the degree of learning a function of the ratio of the amount of time spent in learning to the amount of time needed? Are we correct in postulating an interaction between instructional quality and ability to understand instruction such that pupils low in the latter ability suffer most from poor instructional quality?

One of the most exciting possibilities suggested by the model is that of being able to state parameters for different types of learning by learners of varying characteristics under stated instructional conditions. Perhaps ultimately such parameters could be tied back to the data of pure learning theory. One of the bolder hypotheses implicit in the model is that the degree of learning, other things being equal, is a simple function of the amount of time during which the pupil engages actively in learning. Psychologists have paid little attention to this variable of pure time in human learning. A recent experiment by Bugelski (*2*) is one of the few to consider time factors in the field of paired-associate learning; and interestingly enough, it supports the hypothesis that more parsimonious descriptions of learning may be obtained by use of time as a variable rather than, say, number of trials.

What is important to emphasize is that this conceptual model probably contains, at least at a superordinate level, every element required to account for an individual's success or failure in school learning (at least in the learning tasks to which the model applies). The explication and refinement of these factors and the exploration of their interactions constitute a major task of educational psychology. Its other major task is to account for those types of school learning (*e.g.*, attitudinal and emotional conditioning) to which the present model is not intended to apply

and for which a separate model might well be constructed.

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About time for educational reform

H. M. Levin

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A centerpiece of the new quest for educational reform is the transformation of schools to make more effective use of time in learning. The National Commission on Excellence in Education (1983) in *A Nation at Risk* argued for "more effective use of the existing school day, a longer school day or a lengthened school year" (p. 29). Specific recommendations included the assignment of more homework so that learning could be increased outside school; introduction of 7-hour school days in place of 5- to 6-hour days; adoption of a 200- to 220-day school year instead of the typical 180 days; policies to reduce disruptions of instruction; and more effective use of teachers' time for instructional tasks. The Task Force on Education for Economic Growth (1983) in *Action for Excellence* urged every state to "increase both the duration and the intensity of academic learning time" (p. 38). In response to the evidence in these reports, state legislatures are considering increases in the minimum school day and school year. The California legislature passed such legislation in 1983, and the North Carolina legislature approved a pilot project to increase the school year from the present 180 days to 200 days and the school day from 6 to 7 hours for two counties (Aldrich, 1983).

The case in favor of the more effective use of time is based on logic, international comparisons, and research. Clearly, the amount of time that one is exposed to instruction or engaged in learning must bear some relation to what is learned. Moreover, other nations whose educational systems are ranked highly have longer daily and yearly sessions than those of the United States. *A Nation At Risk* compares the United States to England and other industrialized countries where academic high school students spend 8-hour days and 220-day school years (National Commission on Educational Excellence, 1983, p. 21). *Action for Excellence* suggests that "in most of the industrialized countries, the school year is considerably longer than in the United States—often 240 days or longer" (Task Force on Education, 1983, p. 24), and concludes that after 12 years of schooling, students in other advanced nations may have the equivalent of 4 full years more schooling than American high school graduates. Both reports also point out that U.S. students do not fare well in international comparisons of achievement and that the future competitive position of the United States in the world economy is at

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stake if the United States does not follow this and other reforms.

Finally, educational researchers have agreed that the use of time in learning is a prime area for educational reform on the basis of its relation to student achievement. Although some of the research focuses on the total time devoted to schooling, much of it addresses using existing allocations of time more productively. The consensus of educational researchers seems to be that time is a potent lever for increasing student achievement (Denham & Lieberman, 1980).

This article is a review of these recommendations in light of existing research and more general policy considerations. The next section of the paper presents the research background for the present recommendations. The second section focuses on two aspects of time in learning that are often ignored in the research literature and policy discussions. The final section summarizes the overall policy issues that should be addressed. The theme of this paper is that as compelling as the logic and evidence might appear, the consequences of increasing the time allocated to schooling and making its use more effective are hardly as straightforward or as effective in improving achievement as they have been advertised. Indeed, I will argue that there is great danger if these types of prescriptions are applied in a mechanical fashion without considering other factors.

Research on Time in Learning

A major reason for the contemporary policy focus on *time in learning* has been the apparent consensus of the research literature on the subject. For that reason, it is worthwhile to provide a brief review of the major contributions to that literature. More extensive reviews can be found in Borg (1980) and Karweit (1983).

There is little doubt that the recent focus on time in learning owes its origins to the influence of the model of school learning that was proposed by J. B. Carroll (1963). The intent of Carroll's approach was to ascertain how to organize instruction on the basis of a model of student achievement that was constructed around two concepts: the time needed for learning and the time devoted to learning. Carroll postulated that the time an individual needs to learn would depend on one's aptitudes, abilities to understand instruction, and the quality of instruction. In contrast, the time an individual devotes to learning would be determined by the time allocated to instructional tasks and student perseverance.

The central role of time in the Carroll formulation was attractive. It had intuitive appeal, theoretical salience, and a policy orientation. It seemed logical that the more time that is devoted to learning, the more will be learned. The fact that the model integrated time into a framework incorporating both instructional variables and individual student attributes provided direct links to the field of learning theory and research. Finally, in principle, the allocation of instructional time can be incorporated in school decisions designed to improve learning outcomes.

Carroll's model of school learning and its focus on the time variable received almost immediate prominence. It was particularly important in influencing the thinking of prominent educational psychologist Benjamin Bloom in his formulation of the mastery learning approach (Bloom, 1976). Mastery learning represents a strategy for bringing all students to a given level of achievement in a particular learning domain by recognizing differences in students' time needs and instructional needs. By using instructional resources in more efficient ways, the approach is designed to reduce the time differential required for mastery between the fastest and slowest learners (Block, 1971; Bloom, 1968). By the late 1970s, the dissemination of the mastery

learning model had become widespread, and with this proliferation the attention to time in learning had become rather commonplace.

In a separate, but related, research program, Wiley and Harnischfeger began to develop models of time in learning in the early 1970s. They were particularly concerned about how aggregate exposure to schooling affects student achievement and how specific types of instructional time differ in their effects (Wiley, 1976; Wiley & Harnischfeger, 1974). In an initial study, Wiley constructed an *exposure to schooling* variable for individual schools composed of the length of the school day, length of the school year, and average daily attendance. This measure enabled him to estimate a school-by-school average number of hours of exposure to schooling for the schools of a large metropolitan area, an average that ranged from 710 to 1,150 hours a year.

On the basis of a statistical analysis of the estimated effects of exposure to schooling on sixth grade achievement (reported in Wiley, 1976), they concluded that "in schools where students receive 24 percent more schooling, they will increase their average gain in reading comprehension by two-thirds and their gains in mathematics and verbal skills by more than one third" (p. 9). Presumably, this difference in exposure would be assumed to have taken place for the previous 5 years at the beginning of the sixth grade, so there would be an average gain per year of about 13% and in verbal scores of about 7%. Wiley and Harnischfeger (1974) also attempted to refine the notion of time measurement for instruction, distinguishing between total allocated time, usable exposure time, and active learning time. To a large degree their research set the stage and stimulated a body of work that focused not only on the total time devoted to instruction, but also on the amount of *engaged learning time* or *time on task*.

The crucial importance of how instructional time is used was also emphasized in the work of others such as Stallings (1980), who summarized a range of studies that found that the length of a school day or class period in itself was not related to student academic achievement. Stallings (1980) concluded that "student learning depends on how the available time is used, not just the amount of time available" (p. 11).

During the 1970s a number of researchers began to measure the various dimensions of instructional time as an important clue to instructional effectiveness. The most important of these studies in terms of magnitude and prominence was the Beginning Teacher Evaluation Study (BTES) initiated at the Educational Testing Service and implemented more fully by the Far West Regional Educational Laboratory. This 6-year study was sponsored by the California Commission for Teacher Preparation and Licensing and funded by the National Institute of Education. Although the initial purpose of the study was to uncover characteristics of effective teachers that might be incorporated into the requirements for teacher certification, the importance of the study is found primarily in its focus on *academic learning time* (ALT), or the amount of time that a student is engaged in academic tasks at an appropriate level of difficulty.

The most prominent findings of the BTES were (a) total instructional time in a specific curriculum area is positively related to student achievement in that area; and (b) the proportion of ALT in which students are engaged is positively associated with learning (Fisher et al., 1980, pp. 15–16). These findings were based on intense observation and measurement of the characteristics and activities of 25 teachers and 139 pupils in grade 2 and 21 teachers and 122 students in grade 5, and the data were analyzed using

multiple linear regression in which student achievement was the dependent variable (Fisher et al., 1980, p. 13). More than any single study, the BTES has been used to argue the case for increasing student achievement through allocating more time to learning and a higher proportion of that time to ALT or time on task or engaged learning time (Denham & Lieberman, 1980).

Time as a Policy Instrument

The implications of these studies are that the total amount of time allocated to instruction and the use of that time are important policy variables for increasing student achievement. Thus, national reports on educational reform and state legislation have focused on efforts to increase the length of the school day and school year, to improve school attendance, to reduce class disruptions and unproductive use of teacher time, and to increase the amount of student engagement on instructional tasks. To a large degree these recommendations and legislative actions are oblivious to two major issues: (a) interactions between time and other determinants of learning, and (b) the role of the student in allocating time. In this section we consider how recognition of these factors might affect consideration of time in learning.

One way of considering how much a student will learn is to set out a simplified, learning framework that stipulates the principal components of the activity. As with other types of human performance, the amount that will be accomplished or learned will be determined by four factors: capacity of the individual to learn, effort of the individual to learn, time of the individual allocated to learning, and quality of resources available to assist the individual to learn. These can be summarized by the following expression:

(Capacity) × (Effort) × (Time) × (Quality of Resources)

This framework has been discussed for assessing the specification of teacher variables in educational production function models (Levin, 1980), and it has been heavily influenced by Carroll (1963). Its most important attribute in the present case is that it enables us to see where the time variable fits into the learning activity. Before discussing this phenomenon, it is necessary to provide some detail on the formulation.

Capacity refers to the personal attributes of the student with respect to the learning task. Different students have different aptitudes to learn specific subjects. The meaning of aptitude in this sense is much broader than ability, because it includes all factors that will determine the capacity of a student to learn at a given time. Thus, the term includes factors related to intellectual ability, personality, health and nutrition, and emotional strengths and weaknesses. Capacity must always be referenced to a particular learning task or subject, because it may vary along these dimensions.

Effort refers to the intensity of use of capacity to achieve learning *per unit of time*. Learning occurs when the student devotes effort to applying his or her capacity to a specific learning task or set of tasks. The greater the effort, capacity held constant, the more that will be learned. Indeed, students of lower capacity who put in great effort may learn considerably more than those of higher capacity who do not put in such effort for any period.

Time refers to the period devoted to a specific learning endeavor. Time can be allocated to learning both inside and outside the classroom, so different categories can be used to analyze the time dimension. Likewise, even within the classroom it is possible to categorize different uses of time as have the research studies that were reviewed above. Obviously, learning is expected to be an increasing function of time, capacity and effort held constant, and some uses of time would be more effective than other uses.

Quality of resources refers to the amount and type of resources available to the learner. Obviously, this will consist not only of factors such as the quality of instruction, but also the availability of textbooks, other instructional materials, and the characteristics of the learning facility and home.

A major advantage of the formulation set out above, which will be referred to by the acronym CETQ, is that it makes it possible to situate the time variable within a larger set of learning factors. Thus, one can review the linkages among these and their implications for the time dimension.

The capacity of a child to learn is conditioned by his or her mental and physical state at the time learning is to take place, as well as by the child's overall aptitude to learn. Some children commonly lack the nutritional, medical, dental, and housing resources to use their learning opportunities. Even with high levels of effort, large time allocations to instruction, and high quality learning resources, their capacity is limited by their personal situation. Children with nutritional deficiencies, emotional problems, and disease are not likely to learn a great deal more from spending more time on a particular instructional task. Thus, there is likely to be an important interaction between the child's capacity to learn and the effectiveness of additional time.

Situational variables determine not only capacity, but also effort. It is difficult to put much effort into learning when suffering from low energy levels, dizziness, headaches, and other maladies. Of course, effort is also a matter of motivation, a factor that can be affected by the quality of instruction. It is conceivable that extending the time allotted to schooling and particular subjects may actually reduce the level of effort substantially if the quality of instruction and other learning resources is poor. Effort also may be reduced by sheer fatigue associated with additional time.

Finally, the quality of instructional resources clearly has implications for the effectiveness of additional time devoted to learning. If teachers are unqualified, books and materials are in short supply, the curriculum is inappropriate, and classrooms are noisy and overcrowded, additional time devoted to instruction may be relatively unproductive. Indeed, it may be more cost-effective to improve the quality of resources than to increase instructional time.

In summary, there are likely to be important interactions among the various factors determining the amount of learning that takes place. Changing the amount of instructional time overall or for particular subjects will have different effects according to students' capacity and effort and the instructional resources that are used. Even more important, improvements in situational variables that affect capacity and motivation as well as in school resources may be better investments than increasing time. And, some combination of improvements in all of these factors may yield better returns to schooling investments than focusing only on time.

The Student as Timekeeper

Much of the literature on time in learning treats the time variable as a policy instrument that can be manipulated at will by school authorities. The assumption is that by assigning longer periods of instruction and homework, learning will increase. However, once we focus on the time that students devote to learning rather than that of the teacher, school, or educational system, it is obvious that a central decisionmaker on time allocation is the student.

The central concern is that making available more instructional time to students does not necessarily mean that students will use that additional time for learning. "You can lead a horse to water, but you can't make him drink." Essen-

tially, this is the dilemma to be faced. Although one can require more homework and increase the length of the school day or school year or the exposure of students to particular subjects, the amount that will be learned is hardly a mechanical function of the time allotment. If students do not listen or concentrate on their studies or put much effort into them, the additional time may be wasted or even counterproductive. Accordingly, it is important to ask how students allocate time and effort to their studies.

A useful way of understanding the student's decision is to consider how a student with given capacity would maximize his or her welfare, given resources of time and effort. Certainly this type of analysis can be done within the general framework developed by Becker (1965). In general, it can be expected that time and effort would be allocated across activities such that their marginal allotment to different activities would provide an equal contribution to individual welfare. That is, for each activity there is a contribution to welfare or happiness that is determined by the product of effort and time. If it is assumed that there are diminishing marginal returns to each such product (and to time or effort themselves) when applied to each activity, there is some combination of activities and time and effort allocations that will be optimal for each individual. In this case, the decision will be determined by personal preferences as well as by the effects of effort and time in transforming activities into individual welfare.

Any activity can create an increase in the welfare of the individual in three possible ways: First, there may be a consumption benefit from the activity through the generation of intrinsic rewards; second, there may be extrinsic rewards conferred by the school and parents; and third, there may be extrinsic rewards conferred by society. In principle, the larger the value of these rewards to the individual for any learning activity, the more time and effort that will be devoted to it.

Intrinsic rewards refer to the satisfaction received from the activity itself. For example, if reading literature or solving mathematics problems provides its own pleasure to the learner, he or she will wish to pursue those subjects at least in part for the sheer joy of the activity. The obvious educational implications are that one way to increase both the time and effort devoted to a subject or to schooling more generally is to make it more interesting and engaging. This view is at the heart of Dewey's vision of schooling, where the intrinsic value of the activity is central in determining if the educational activity is worthwhile (Dewey, 1966, chap. 18).

However, schools rarely operate on the basis of motivation through intrinsic rewards. More typically, students are expected to pursue learning activities because of rewards provided by parents, the school, and society, and the expectation of future economic success (or the fear of future economic failure by doing poorly in school). For example, the school has at its disposal such sanctions as grades, promotion, social praise, detention, and a host of other ways that students can be rewarded for appropriate behaviors and punished for inappropriate behaviors. By manipulating these sanctions, teachers and schools and the educational system attempt to influence the time and effort that students devote to their studies. Again, it is important to remember that even when the school increases the time requirement for instruction, students can reduce their effort, so that mandatory time allocations in themselves may not be effective without these sanctions.

A related set of extrinsic sanctions is conferred by parents. To the degree that parents have control over many of their

children's activities and can provide valued rewards for "appropriate" school behavior, extrinsic rewards provided by parents are also important sources of student behavior. If parents value educational achievement for their offspring, they are likely to confer praise, gifts, opportunities, and pleasurable activities on their children in relation to school performance. Likewise, they are likely to withhold such rewards and restrict their children's activities when school performance is considered inadequate.

The implications of this system of rewards for motivating students to allocate greater time and effort to their studies, both in and out of school, are obvious. By strengthening and increasing the sanctions used to provide motivation to learn, the school can increase students' time and effort. However, there is the danger at the extreme that such a system of social control will be so unpleasant and pervasive that it will have counterproductive results, such as increasing the tendency to drop out.

The very fact that these systems of control are so central to the schooling experience suggests that student behavior is not predicated on the intrinsic rewards. That is, most students attend school and conform to the organizational demands of schooling, not because it is the way that they would choose to spend so much time, but because it is compulsory, expected by parents, and has a payoff in the future. Even beyond the parental and school sanctions, schooling is valued because of its expected future returns in terms of access to more schooling and eventual earnings and occupational rewards. It is this economic return to schooling that is probably the most important source of motivation for attending the noncompulsory segments of school and for conforming to the schooling regimen during the compulsory portion.

The power of schools to determine student behavior because of their links to future economic success can be fully appreciated only by considering what students must relinquish in the schooling process. School requires that a student give up control over much of the process and product of his or her own activity. For most youth, the general schooling environment and the fine details of the curriculum are determined without participation of the students who are affected by those decisions. Although there is more choice outside the school environment, homework requirements tend to constrict the form and substance of such activities as well. Under these circumstances, it is hardly surprising that schooling would not be pursued for its own sake. Without participation in choosing and influencing one's daily activities, there is likely to be little intrinsic attraction to the experience (Blauner, 1964; Fromm, 1968). This is a major reason that schooling must be compulsory and that there are strict rules on attendance.

Students are motivated to go to school by factors beyond compulsion of the state and family to the degree that schooling and study can be converted into future gains of income, occupation, employment, and social status rather than schooling's intrinsic value. That is, beyond the schooling experience, educational credentials are commodities that can be exchanged for success in future economic well-being.

But consider the implications of these assumptions. If the time and effort that are devoted to learning are heavily determined by a reward structure that is external to schooling, there must necessarily be only a limited potential control of students' time and effort allocations through educational policy. Rather, the expected ties between educational performance and future income, employment, and status consequences will have an important

influence on how students allocate time and effort to learning and other activities.

Thus, if expected income associated with a particular educational credential falls, it would hardly be surprising to find students reducing their time and effort in pursuing that credential. Indeed, the poor employment and earnings prospects for high school graduates have reduced the incentives for high school completion for youth who simply have no reason other than future economic prospects to stay in school. Likewise, the economic returns to college completion have fallen as college graduates compete for poorer job prospects and incomes than they might have obtained in the past and as the income advantage of college graduates over high school graduates has fallen (Freeman, 1976; Rumberger, 1981).

Not only have the extrinsic rewards for academic accomplishment declined for most of the youth population, but even the incentives to do well in order to undertake further study have diminished. For example, it has become easier to obtain admittance to college as the number of potential applicants declined in the face of unprecedented growth in college spaces. Many colleges and universities are even advertising for students. The result is that the incentives to take difficult courses and achieve high test scores to gain college acceptance are much lower today than they were in the past. The College Entrance Examination Board (1980) reported that 83% of college applications were accepted for the 1979–80 academic year. Because all institutions offered admission to more students than those who actually enrolled and many students made multiple applications, it was concluded that the entire applicant pool was accepted. This situation contrasts with the 1950s, 1960s, and early 1970s when college admissions were more competitive and there was a scarcity of places relative to the burgeoning population of high school graduates. As colleges have become easier to gain entrance to with the drastic decline in youth demography and as private rates of return to higher education and job prospects have declined, students may be putting less time and effort into their studies.

Certainly, this explanation is consistent with the evidence. Studies at the secondary level have found profound shifts away from the academic subjects (U.S. Department of Education, 1981), rising dropout rates (Rumberger, 1983), and falling test scores (Wirtz, 1977). Although recent reports have blamed the schools for these problems and have urged greater compulsion, more discipline, and more rigorous grading standards, what has been ignored is that the schools may have little control over this behavior. Factors that are largely external to the school may have influenced both student performance and the allocations of time and effort to their studies. As the economic returns to college completion have fallen, the time and effort of youth in studying and preparing for examinations may also have fallen. For example, a study by Dresch and Waldenberg (1978) based on a cross-sectional study using regional earnings differences by educational level found that a 1% increase in relative earnings of college graduates increases test scores of high school students. Lerman (1972) also found economic impacts on high school attendance patterns.

The central point is that increasing homework and time on instructional tasks may have small effects on learning if there are few rewards to the individuals who must allocate the additional time and effort in these directions. More ominous is the possibility that by increasing the "costs" to the student by requiring more time in what is often an oppressive and uninspiring environment, dropout rates may increase and some students may lose interest in further learning. In addition, some students may reduce their effort to compensate for the larger time commit-

ment they must make.

In summary, the allocation of time and effort to learning will depend crucially on the rewards associated with particular time and effort allocations. Compulsory increases in instructional time may have little achievement payoff if students reduce their efforts or drop out. Accordingly, any effort to increase student time allocations to learning must consider not just a mechanical allocation of time, but the degree to which the existing system of rewards will encourage student effort and voluntary time on that learning task. Policy manipulations of instructional time in themselves may not yield the expected fruits suggested by the national reports.

Time and Educational Policy

Once again we return to the reasons that the reformers have viewed the increase of instructional time and time on task or engaged time as crucial ingredients for improving student achievement. The first reason was the compelling logic that more instructional time and better use of instructional time would lead to higher student achievement. The second reason was that other industrialized countries devote more time to schooling than does the United States and reportedly obtain better results. The third reason was that educational research has found impressive relations between time in learning and student achievement. Let us review each of these in retrospect.

Both logic and common sense support the explanation that increasing instructional time will improve student achievement, and there is obviously no evidence that I have provided that can challenge it. However, note that the argument is a very abstract and general one. It does not address either the strength of the relation or the possibility that it may be more pertinent under some circumstances than others. In the first case, the relation may hold, but the results may be so modest that they are relatively unimportant or even irrelevant to public policy. For example, assume that an increase in the length of the school day and days in the school session provided a rise in instructional time of 25% but an increase in student achievement of only 3%. Further, if schools are spending an average of about $2,000 a year on instructional costs exclusive of buildings and facilities, we can assume that the increase in costs would be about 25% as well, or $500.

The crucial policy issues are whether it is worth an allocation of an additional $500 per student to increase student achievement by 3% and whether there are other alternatives to increasing the time allocation that might be even more effective for the same cost outlay. For example, a rise in the budget of $500 per student could be used to retrain teachers or attract more talented teachers, to reduce class size, to hire remedial specialists, or to use instructional technologies such as videotapes and computer-assisted instruction. It is certainly not clear which of these alternatives or which combination is the most preferable from a cost-effectiveness perspective (Levin, 1975, 1981, 1983). Accordingly, the logical arguments are not adequate without empirical results suggesting that increasing time in learning and its effectiveness provide results that are strong enough to justify the investment and are superior to investing an equal amount in other alternatives. The case cannot stand on abstract logic alone, but must also rest on concrete evidence on these points.

The international case has been made on the basis of associating the amount of schooling received in other countries with the achievement levels of these students and with the strength of their economies. It has been argued that the superior achievement of students in other industrialized societies is closely related to

their greater exposure to schooling through longer school days and school years and that the economic success of such countries is connected to student achievement. *Action for Excellence* makes a special effort in forging this link by linking the vitality of the Japanese economy to its schools (19–20).

Husen (1972) addressed the evidence from the International Education Association's (IEA) international studies on mathematics achievement in 12 countries (Husen, 1967). Data on student mathematics achievement, student background, teacher characteristics, and school characteristics were collected and analyzed to ascertain differences in national performance and the explanatory factors determining differences in individual and national performance. Because international achievement tests were used, it was possible to evaluate examination results among countries as well as within them.

Of greatest importance in the present context were the findings on the effects of the amount of schooling exposure to achievement. Using a statistical analysis to explain achievement that included factors such as students' home background, teacher characteristics, and other variables, an attempt was made to single out the effects of a group of school variables related to time devoted to schooling. A combination of the number of hours in the school week, the time devoted to all homework, the time devoted to mathematics homework, and the time given to instruction in mathematics taken together were able to explain only 3% of the total variance in achievement of the mathematics test among 13-year-olds. It is important to point out that there was wide variance in policies among the 12 countries so that, for example, the country with the lowest amount of weekly instruction in mathematics devoted about 4.3 hours a week, and the one with the largest amount devoted 8.9 hours to it.

Other IEA studies found rather different effects of time on learning. The strongest effect was found for the study of French as a foreign language, in which the years of foreign language study were very closely related to student proficiencies among countries (Carroll, 1975, p. 180). This is hardly surprising, given the centrality of schools (as opposed to out-of-school environments) for learning foreign languages. In contrast, science scores among nations appeared to be almost unrelated to differences in time devoted to the subject (Passow, Noah, Eckstein, & Mallea, 1976). This is a somewhat discouraging finding, given that many of the reforms for strengthening American education are especially concerned with improving learning in science and mathematics. A fair summary of the IEA findings would suggest that increasing time in learning is associated with strong effects for the teaching of foreign languages with only modest or imperceptible effects for other subjects. These results are sufficiently idiosyncratic that caution is needed in expecting strong across-the-board gains from increasing school time and in assuming that international differences in achievement are due primarily to the time variable.

Finally, the issue of comparative performance in student achievement between the United States and other industrialized countries should be clarified. The United States educates a very large share of its secondary school age population, whereas most other industrialized countries do not. Because countries with more elite educational systems are enrolling only the most talented and advantaged segments of their youth in academic secondary schools—often on the basis of a competitive examination—the achievement of such students should be compared only with comparable cohorts of U.S. youth. Although the IEA studies found that the United States ranked be-

low other industrialized countries in average achievement, it found that the top echelon ranked favorably with similar cohorts in the more selective schooling systems of Western Europe (Husen, 1974).

Clearly, the international evidence is not as supportive as the assertions of the reports would suggest. Differences in time commitments to education among nations do not appear to account for much of the variance in achievement, and the achievement of U.S. students is comparable to that of students in other countries if an attempt is made to compare groups at similar levels of educational accomplishment. Thus, the third area for scrutiny is that of U.S. research findings.

In reviewing the research evidence on time in learning, it is important to note that there are many potential approaches to increasing time allotments to learning. For example, one can increase overall exposure to schooling through a longer school year, school day, and improved attendance patterns. One can increase time on particular subjects and/or particular topics within subject areas. One can attempt to increase the time spent on homework. Finally, one can attempt to improve the allocation of instructional time by reducing classroom interruptions, by reducing "housekeeping" and clerical tasks of teachers, and by increasing the amount of engaged time. The overall body of research findings is too limited to test all of these possibilities.

However, it is possible to divide the research into two broad categories: that which looks at overall time allocations to schooling, and that which looks at engaged time or time on task. The most dramatic effects on overall time were found by Wiley and Harnischfeger (1974), who concluded that a 24% increase in hours of schooling would produce an increase in reading comprehension of two-thirds and in mathematics and verbal skills by more than one-third (presumably over the previous 5 years for students who were tested at the beginning of sixth grade). However, their analysis used relatively weak statistical controls for the family background of students, and there were no controls for differences in school quality. To the degree that schools with low attendance and shorter days enrolled students from disadvantaged families and had meager school resources, the lower achievement of students in those schools may have been largely attributable to these other factors rather than the lower time exposure to schooling.

The Wiley and Harnischfeger results were based on analysis of sixth grade students in 40 schools in the Detroit metropolitan area from data collected by the Equal Educational Opportunity Survey in the autumn of 1965–66. Karweit (1976) used the same data source and a similar statistical approach to apply analysis to other major metropolitan areas, but she found far smaller effects than those found for Detroit. She also did a separate analysis for third, fifth, seventh, and ninth graders in Maryland for four subtests of the Iowa Test of Basic Skills, in which family background variables, a measure of cognitive ability, and percent of students in average daily attendance were used to explain achievement. The effects of attendance patterns were found to be very modest in this and in a number of other data analyses carried out by Karweit and her colleagues.

Although some studies find some effect of allocated instructional time on learning (e.g., Lahaderne, 1968), others find no effect whatsoever (e.g., Frederick, Walberg, & Rasher, 1979; Stallings, Needels, & Stayrook, 1979). Other than the Wiley and Harnischfeger study, no one has found powerful effects to suggest that increasing the length of class periods, the school day, or the school year, in themselves, would have profound effects on achievement or that the results would justify the cost of such changes.

This brings us to the issue of time on task, engaged time, or ALT reflected in the BTES. Although the BTES is the most widely cited on the potential effects of using time more effectively, it too should be used very cautiously as a basis for policy. First, it is based on a limited sample with respect to the total numbers of students and teachers, grade levels represented, and measures of time on task. It is hard to argue that 25 second grade teachers and 21 fifth grade teachers and 139 second grade pupils and 122 fifth grade pupils in a sample of California elementary schools are representative of all teachers, pupils, school levels, and so on. Second, although 35% of the separate analyses of ALT on the separate subtests showed statistically significant results at the 10% level of significance, 65% did not (Borg, 1980, p. 67). Results were often inconsistent between grades as well. These results argue against generalizing the effect of ALT across subjects and grades, even with the limited sample under study. Indeed, Cohen and DeAvila (1983) argue persuasively that classroom organization and the nature of the instructional task are also likely to influence heavily the achievement associated with any particular time intervention.

Karweit (1983) questioned whether it was possible to increase student achievement substantially within a reasonable increase in instructional time. She calculated that it would take about an hour of additional instruction to raise mathematics scores by .25 standard deviations, from the 50th to the 60th percentile. She concluded that "quite sizable changes in learning time would have to occur before having a detectable effect on achievement" (p. 33).

But there are other cautions regarding the use of BTES results as a basis for the policies suggested in the reports. Both from a conceptual and empirical perspective, little is known about the measurement and manipulation of engaged time. For example, different definitions and observational approaches have been found to produce substantial differences in the assessment of engaged time (Karweit & Slavin, 1982). Further, BTES did not undertake a policy manipulation of engaged time to see how purposive changes in the measure might affect achievement. Rather, the evidence is based on relating observed variations among existing teachers and students in the use of time to students' achievement scores. Even given the efforts of BTES to control statistically for additional factors that might affect achievement, there may be other unmeasured characteristics of teachers and students associated with high rates of engaged time that may also account for higher achievement scores. Especially important in this regard is that student time and effort allocation decisions have a great bearing on engaged time, and these are often beyond the scope of teacher decisions, a point that was stressed above.

A different set of studies is based on retraining teachers to use instructional time more effectively. For example, Stallings et al. (1979) did a quasi-experimental study in which teachers were taught how to better manage classroom time to devote more time to instruction and to student engagement. Student achievement was increased substantially relative to children whose teachers did not receive the retraining. Other approaches to teacher retraining that have emphasized more effective management of instructional time have also been able to demonstrate increased student achievement (Anderson, Evertson, & Brophy, 1979; Crawford et al., 1978; Good & Grouws, 1979). Accordingly, the evidence on altering the teacher's use of classroom time to improve student achievement seems to be more substantial than that which relates the amount of time to what is learned. However, it is clear that replication of these results for a wider range of students, subjects, and settings is in order.

Perhaps the relative modesty of the findings that relate instructional time (as opposed to how that time is used) to student achievement is due to the possibility that unless students perceive the importance of allocating more time to learning, they may reduce their levels of effort. From the school's perspective, the most obvious policies are to improve the intrinsic attractions of the schooling experience or to improve the extrinsic sanctions associated with the desired time and effort allocations. The former is difficult to accomplish because many teachers and schools do not know how to make learning a vital and engaging activity. Yet, it ought to be a priority in school reform if the new emphases on increased instructional time, homework, and academic requirements are to be implemented in an effective manner. Although motivation through extrinsic devices can be accomplished by tightening school discipline, a highly repressive environment may actually inure students to the overall schooling experience by creating automatons who follow the letter of expectations while avoiding their spirit. Such policies may also increase school dropouts.

The most reasonable conclusions on time in learning seem to be the following:

1. The effectiveness of increasing the time available for instruction and learning seems to be dependent crucially on how that time is used. Simple mechanical increases in the use of time may not have a significant impact on achievement or other school outputs, and they are likely to be costly relative to their effectiveness. Unfortunately, it is exactly this type of recommendation that is central to recent calls for educational reform. The empirical evidence also suggests that the effects on achievement will vary substantially among students, subjects, and instructional settings. However, the overall body of research findings on the subject is much thinner than implied by the claims of some researchers and policy analysts.

2. Research on time in learning should focus on studies in which total instructional time and engaged time are manipulated experimentally to see how they affect academic achievement among different student populations, grade levels, modes of classroom organization, and subjects. Such research should also concentrate on how particular approaches to increasing time affect achievement such as increasing the school day, the annual school session, class periods, and time devoted to specific subjects and topics.

3. Research should also seek to learn more about the interactions between the use of time in learning and student effort and the effect of both extrinsic and intrinsic rewards on getting students to allocate time and effort to their studies.

4. Policy evaluations of different approaches to increasing instructional time and engaged time should focus on costs and effects of the alternatives. These should be compared with other instructional interventions for their cost-effectiveness rather than assuming that time-based improvements in schooling are superior to other alternatives.

Although the evidence on the effectiveness of increasing total school time, total instructional time within school, and total engaged time seems to be more modest than the expectations implied by recent calls for school reform, this does not mean that such policies ought to be abandoned. Rather, it means that a largely mechanical approach to time allocation should be avoided. Individual teachers still ought to explore how their time can be used more efficiently to provide instruction. Schools should seek to determine in which subjects and for which students more time is required for learning and how to provide that time most efficiently. All participants should focus on how existing time can be used more effectively by engaging students more fully and making school a much more vital and exciting experience

than it presently is. But, each of these policies must be a sensitive and selective one rather than a broad brush approach to reform.

Finally, it should be humbling to researchers and policymakers alike to recognize that in the last decade three major national reports have argued that many of the problems of adolescence and causes of inadequate development for adulthood are created by the fact that youth spend too *much* time in school rather than too little (Brown, 1973; Coleman, 1974; Martin, 1974). How is it that the "facts" and expert advice can change so quickly and profoundly? One shudders to think of the paroxysms faced by schools if decision-makers were to respond too quickly to the recommendations of the major reports on educational reform.

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4 The secondary school: Administrative wonder and educational absurdity

K. Harris

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It is Thursday; five past one. Johnny Jones is sitting at a desk in Room 15 at the Cecil Pitt Memorial High School, part of class 7D, doing maths with Mr Square. Why?

Well, to begin with, Johnny is only twelve, and the law says he has to go to school. And last year he was in sixth class at a primary school, so this year he had to change and go to a high school. His parents can't afford Kings. He lives in the catchment area for the Cecil Pitt Memorial High School. So there he is: in first form (even though he can beat any third former in science, yet he is miles behind in English).

More precisely, he's in 7D, because first form is divided alphabetically into classes of 35, and Jones is the 112th name on the Register. So he does all his lessons with 34 others from Hartfield to Nelson. Alas, his best friend, whom he worked so well with in primary school, is named Wilson.

He's in Room 15 because that's his home room; an ordinary portable with desks, chairs, and a blackboard out front. he goes there for five subjects, guidance and Roll Call. Truly it is a room for all purposes, but being unheated and poorly insulated, not for all seasons. He's doing maths because it's sixth period. And it's sixth period because on Thursdays Roll Call is at the end of the day because of Scripture in the morning, and the last three periods start earlier. If it were Wednesday he'd still be at lunch. If his name were Anderson he'd be in Room 4 (which is well heated) with Mr Sweet, his favourite teacher.

And it's a maths period because once upon a time somebody decided that maths was a good thing to be taught in schools. And once upon another time somebody said maths was a self-contained subject which could best be taught in maths lessons. And once upon another time somebody said all first-formers should have six maths lessons a week. But basically it's a maths lesson because somebody noticed that maths would fit in there.

So there sits Johnny; accidental victim of his age, address, surname, parental lack of financial means, Syllabus Board decrees, and the Ministers of Religion's decision to visit his school on Thursday morning. But he's also victim of the esteemed timetable committee!

Basically Johnny Jones is in Room 15, doing maths with Mr Square at 1.05 pm on Thursdays because last November the timetable committee got to work, and one of them, who had never laid eyes on Johnny Jones or Mr Square or Room 15 (these all being at different schools) drew a black box, put a blue circle on it, stuck a red pin into it, wrote '15' across it, and proudly announced that it all worked out. Every class had a room for every period, no two classes were in the same room at the same time, no teacher or class was in two places at once; and to cap it all off Mr Square had his 28th teaching period and 7D its sixth maths lesson of the week!

The committee drank long into the night. They had done a perfect job, and the school was ready to tick over smoothly next year.

Enter Johnny Jones. A bell rings and he goes to Room 15. Right now he's there, doing maths with Mr Square. And he thought he was coming to get educated.

Introduction

According to popular rhetoric secondary schools exist to fulfil an educative function. I have challenged this notion in considerable detail elsewhere, arguing that contemporary schooling has little to do with education and much to do with social control and reproduction of bearers of labour power. In this article I shall approach a lesser but more practical and tangible issue; and demonstrate that within the present system of secondary schooling in Australia those concerns which could be considered 'educational', or related to the 'educative' function of schooling, are subordinated to, and consequently impeded and perverted by administrative concerns, to the extent that the secondary school can be appropriately described as an administrative masterpiece, and a paradigm case of educational absurdity.

Before unfolding this argument, which will largely be a matter of questioning certain basic phenomena which appear to have become accepted as integral and necessary features of secondary schooling, I want to stress two points. First, I will be speaking in generalisations; and while each and every point I make may not apply to each and every secondary school in Australia, I am certain that most points apply to most schools, and in fact that all points apply to just about all schools. In this context, therefore, the citing of individual contrary cases and instances will hardly invalidate my thesis. Second, in pointing out absurdities within an overall context of institutionalised compulsory schooling I am by no means suggesting that such a context, if purged of those internal absurdities, would then emerge as a valuable educational venture, let alone as the best of all possible educational ventures.

The School Day

All children in Australia are compelled to go to secondary school. For most this means something like six hundred days of attendance. Many remain at school after the overt compulsion has been removed in order to take out a first certificate, thus raising their experience of secondary schooling to around nine hundred days; while the few who chase matriculation or a higher certificate attend school for up to thirteen hundred days. Each of these days follows very much the same sort of pattern. The greater part of the day is taken up by lessons, usually eight, and these lessons are punctuated by two recesses. So there is lesson time — for the whole school — in which pupils are supposed to be devoted solely to learning, and recess time — again for the whole school — in which pupils can stroll around, go to the toilet, eat their lunch, visit the tuck shop, and play. The picture is familiar enough, and at first glance, reasonable.

The structure of the school day appears to be justified partly in terms of common sense and general needs (lunch time, for instance, coincides with that time when most people get hungry and eat lunch), partly in terms of administrative convenience and efficiency, and partly in terms of educational benefits, or at least in terms of the lack of any educational harm. However, the real truth is that the structure of the school day, as we know it, satisfies only the condition of administrative convenience; it is *not* administratively efficient, and it does a great deal of educational harm. Let us briefly consider the matter of administrative efficiency first.

No school tuck-shop can serve a thousand children in a fifteen-minute recess; no school toilet-block can relieve sixty children a minute; and no school playground can accommodate even a quarter of the school population *at play* at any one time. The results are that resources are used *inefficiently*, and that children miss out on important things. Tuck-shops, serving for about an hour a day, are notoriously inefficient, and the prob-

lems that arise in their rush hours are well known to all secondary school teachers: long queues, impatient children, and congestion bring additional problems and duties to teachers who could well do without them. And pupils have been commonly known to forsake food and drink for other ends when there is simply no time to fit both of them into a recess — the number of secondary school pupils who skip lunch, or literally eat it on the run, is alarming. Of toiletting more will be said later; here let one simple recognition suffice, namely that school administrators can only be thankful that many pupils ignore their admonitions to go to the toilet at recess-time. Of play also very little needs to be said except that all pupils at all levels of the secondary school need play and exercise, and most are denied any meaningful sense of this by the policy of lumping all the pupils into the playground together at the one time. In summary what we find in the system of fixed, universal recess breaks is great administrative convenience but gross inefficiency in the use of resources.

The matter of educational harm, however, is of far more importance. The argument given to support the educational efficacy and desirability of the school-day structure runs like this:

(1) The educational goodies are there to be had in lessons.

(2) Pupils not physically present in lessons, because they are out playing or relaxing, or at the tuck-shop or the toilet, must miss the goodies; and those relaxing, eating, or otherwise inattending in class might miss the goodies.

(3) *Conclusion:* Therefore it is educationally desirable for all pupils to be in lessons when lessons are on (from which it follows that there should be non-lesson times for other necessities).

The problem with this argument is that it is totally invalid. Even if (1) and (2) were true, and they may not be, the conclusion does not follow logically and the statement regarding educatonal desirability is false.

With regard to the first premise, it could be argued that lessons do not present what is educationally desirable, and in fact serve to keep children away from more educationally desirable things outside of the school or classroom. Now since I am concerned here only to examine what goes on *within* the secondary school, I will not even entertain such a wild thought, and so I will accept, for the purpose of this argument, that (1) is true. Also, at this point I will accept (2) as being true, although later I shall indicate some serious doubts about it. I now want to show why the conclusion is false.

In the first place, to say that children absent from lessons, or parts of them, will, or could, miss out on certain educational gains is not the same as saying that children present in lessons will gain what has been made available for them, or that they will benefit in any way from what are thought to be worthwhile offerings. There are three well-substantiated facts that should be remembered about school-type lessons. First, only a small proportion of lesson time is employed in effective teaching and taken up by effective learning. Second, some pupils learn nothing of the content of some lessons. Third, for some of the pupils who do learn the lesson content, this content is of no benefit to them whatsoever. Now the incidence of these sorts of things will vary from teacher to teacher, subject to subject, form to form, and A class to Z class; but the general points still hold. School lessons are notoriously inefficient, and notoriously lacking in real benefits for some children. From the first fact above we realise that some pupils could be absent from some parts of some lessons without educational loss; from the latter two facts we see that some pupils could be totally absent from some lessons without educational loss. Let us reinforce this by considering a specific instance.

A teacher is required to teach the use of Cosine tables (subtract the differences — remember?) to a 9E class. The school is in a depressed area, and most of the class will leave before the end of the

year. But the lesson begins. There are a few announcements, some disciplining and calling for attention, a motivation step and some revision. Then the new skill is introduced, explained, checked, revised, explained again, and then practice is given in using the skill. Now in this lesson what might have happened and what does commonly happen is this: some children effectively learnt the skill in less than a minute, some took longer, some left the lesson at the end no wiser and no more skilful than they were at the beginning, and some who did learn came into possession of something as near to totally useless and valueless for them as anything might be. But imagine various pupils in this class saying to the teacher: 'I've now learnt what you intended to teach (after 4 minutes) so I shall go to the library'; or 'I'll never learn this so I'm going to glaze my pots'; or 'You always take twenty minutes to quieten the class, mark the homework and revise, so I'll come back then'; or 'This won't help me at the biscuit factory so I'll go and have my lunch in peace now'. The point is that, educationally, these children would lose nothing, and they could follow other interests or do their eating, toiletting, playing or relaxing in at least a more civilised fashion, while at the same time taking pressure off the school's resources.

That was a fairly negative argument, and while there may be a lot in it, it is not, when taken alone, convincing enough to establish the educational wisdom of no longer requiring compulsory attendance for all pupils for the full duration of all lessons. What has to be shown is that the policy can be educationally harmful, not merely benign: and in practical terms compulsory attendance at all set lessons *is* often harmful to and destructive of the particular educational venture which the school supposedly undertakes. Let us examine this contention in the light of three real issues; boredom, fatigue, and pupil interests.

Some pupils get bored at some time in some lessons. On an ideal plane perhaps this shouldn't happen, but in reality it does happen, and it happens often. Now a bored child is likely to take one of two options; either passively tolerate the boredom, or rebel. The child in the first category is a tragic figure, well on the way to accepting alienation as either a necessary or inevitable part of existence. Tolerating lesson situations where the context and content pricks no personal interest or involvement is good training for tolerating similar but more long-lasting work situations; but even within school the pupil who learns to tolerate boredom by staying in boring lessons has had the learning experience perverted, and has been done great educational disservice.

Bored pupils who rebel may do so in one of two ways. They might passively switch off, fall asleep, or day-dream; or else take to active pursuits with which to occupy themselves, like doing homework, talking, or generally stirring up mischief. Either way they cause problems for themselves, and perhaps others into trouble; and their actions reduce the effective teaching time of the lesson, and perhaps the effective teaching life-span of the teacher. The child who merely day-dreams can interrupt teaching points and drain off teacher-energy, and divert the attention of other pupils. The child who begins a dart-throwing exercise can quickly claim the attention of most of the class, get many otherwise innocent children into trouble, and reduce a lesson to an exasperated inquiry and outburst on the part of the teacher, who might then approach this class with less interest and enthusiasm for the remainder of the year. The most common case, of course, is that of minor discipline problems, but the general conclusion holds true: bored children get themselves and others into trouble and reduce the educational efficiency of the classroom. For these children, for their classmates, and for their teachers it would be educationally advantageous if they quietly left the classroom, went to the tuck-shop, or strolled around the grounds when their interest and enthusiasm for the lesson work reached the irretrievable level.

But would not all pupils, or most, simply walk out whenever a lesson began to become boring? Probably; and what if they did? This just might be the spur needed to jab some teachers out of their complacency in method and direct them to seek more stimulating ways of teaching. Or it might be enough to get people looking hard and seriously at curricula which don't interest children in spite of teacher efforts. Of course it could be argued that what children are interested in, and what is in their interests, might be two different things; and this leads to a second, but related problem. Might it not be the case that pupils will, out of immediate boredom, leave lessons (and courses) prematurely before either what interests them and/or what is in their interests is brought to light? Two fairly glib answers will have to suffice at this point. First, our decisions about what is in children's interests are notoriously bad when made and applied in a general way to all children — learning trigonometry may be in some children's interests but not in all children's interests — so there may not be too much harm involved. Second, it is my guess that pupils who left lessons (and courses) through boredom would largely be those who, at present, stay but are not educationally advanced by the lessons they stay in. There are empirical questions to be answered here, but there appears to be a sound *prima facie* case for suggesting that less educational harm would ensue even if too many pupils left lessons too often, rather than if the really bored remained to disrupt them (if the kids had decent places to go to, e.g. cafeterias, pleasant grounds, then their release would hardly result in lessons being disturbed from 'without').

Fatigue, like boredom, is another fact of school and pupil life. Occasionally pupils come to school fatigued. Some run out of energy before the end of a lesson, or before the end of a day, or before the end of a week; and this for countless different and changing reasons. The same applies to teachers; and teachers are, by and large, well aware of the problem. Last period of the day, and especially last period on Friday, are often toned down. But teachers, no matter how aware they might be, are faced with three problems here. First, they are teaching subjects and have to follow the master timetable. The primary-school teacher can program sport or choir practice on Friday afternoon; but the secondary-school teacher who has been allocated 8E for Maths last period on Friday, has to give 8E *Maths*, and no matter how toned-down it is, it is still Maths. Second, teachers teach classes, not individuals; and third, teachers are responsible for the curriculum content being covered by their classes. It is largely for these reasons that the individual worn-out child is not allowed to go to sleep, have a refreshing stroll, or leave early; and that content is always pushed on with, often hardly less than relentlessly — 'I know it's hot and you're tired, but we have to complete this topic by the end of the month'. The overall result is that very often pupils must remain in classes, and continue working, when they can no longer continue working profitably, either in general or at the specific assigned task. And here we can often find a paradoxical situation where teachers who advocate short rest periods in private study, who regulate their own study according to available energy, and who perhaps the night before walked out of a university lecture because they were too tired to benefit from it, force children to continue to work at a subject (arbitrarily programmed at that time) when some or all of them may be unable to gain anything from continuing.

Now as was the case with 'boredom', there is again a negative and a positive case to be argued regarding fatigue. The negative side can again be put in terms of 'no greater losses'. The child who is burnt out after six periods would probably do just as well to miss periods 7 and 8 as to attend them: the child who reaches the point of diminishing returns in a lesson might do just as well going for a walk as persevering for ten more minutes. But the positive case once again can be made in terms of increased educa-

tional efficiency and benefits arising from letting children leave lessons when they are fatigued. Imagine three children, one worn out before school starts because of some home problem the previous night, another noticeably tiring after period 6, and a third reaching his or her limit half way through any lesson. The first child is allowed to sleep in and comes to school after lunch; instead of eight disastrous lessons there might be three beneficial ones. The second child is allowed to have period 7 off to relax, and period 8 benefits. The third child goes and has a shower, in lesson time, and comes to the next class refreshed. Educationally, there are countless situations where children would benefit by being allowed their own personal recess periods; but as things now stand, this is just not on, and children are forced to continue working, to keep trying, and so to risk punishment, when they might be physically and mentally incapable of giving or taking any more. And worse, in many cases they are forced to work on by semi-enlightened teachers who are aware of the situation, who do not always equate lack of effort with laziness, and who recognise the educational absurdity of the whole business, but feel powerless to do anything about it within the institution.

On the matter of pupil interests one important issue can be broached here. It may be educationally desirable (and even this is debatable) to make a child concentrate on maths in a maths lesson rather than on surfing. But when a child has been highly motivated by, say an issue in geography, it is educationally ludicrous to insist that this be put aside merely because a bell has rung at an arbitrarily determined time. Educationally it would be soundest to let the child work on when interest is highest, but in the system we have the child is stopped, and it is vaguely hoped that this interest might be recaptured in or maintained until the next set geography lesson, which may be scheduled for the next day, or even four days' time. And more might be occurring here than a child simply being kept from following a pursuit when motivation is high. If pupils have to stop being geographical in order to study maths, and especially if they are punished in maths for continuing with geography, they may come to hate maths because of what it does to their interest in something else. Therefore, besides keeping children from pursuits which interest them, we run the open risk of developing in them negative attitudes to other studies, to certain teachers, and even to education itself.

There is one further issue which I want to develop in this section, and while it may appear trivial at first I think it has a great deal of significance. It is the matter of pupils going to the toilet. As indicated earlier, secondary school pupils are given two recesses daily, partly for toiletting purposes. The child who wants to go to the toilet during lesson time has to gain the teacher's *permission;* which must be one of the most degrading practices imaginable. Of course it will be retorted that teachers always, or almost always grant such permission, at least in genuine cases; but this, even if it were true, is not to the point. Since pupils must seek permission, it is the teachers who really decide when a child can go to the toilet, and while they might always grant permission, the fact that they have to be *asked* means that they have the real and definite right to refuse. This, in principle, is abhorrent and intolerable.

But the abhorrence, and with it, degradation, becomes worse and more obvious when we find some teachers at some times either equivocating or refusing. There are occasions where children are not given permission straight away. The child might be asked to detail prior toilet visits during the day. Sincerity might be questioned — a move which usually forces sincere pupils to plead with their teachers. A parental note might be requested; which is one of the school's ways of objectifying a basic mistrust of pupils. Or the child might be threatened with the knowledge that this is the last time permission will be granted today, which in certain cases could be terrifying information to have to exist

with. Such are the glories of teacher equivocation; but sometimes teachers go further and actually refuse, and the common grounds for refusal are: 'You've already been once this lesson'; 'The bell will go in two minutes'; or 'It's only five minutes since recess — did you go then? No! Well, you should have'. What, one has to ask, have these things to do with a child's bowels and bladder? Administratively it might be nice to have all movements confined to certain times in the day (even if, as we have seen, it couldn't work in practice) but from a humane point of view it's abhorrent. And educationally it's wicked — how can a child who *really* needs to go to the toilet concentrate on and benefit from lessons?

'Aha!' my detractors might cry, fastening on to one sense of that ambiguously emphasised 'really'; 'the whole point is that children use going to the toilet as an excuse to get out of lessons, and this is what teachers must be on their guard against'. Well, that might be in part true. Certainly children are unlikely to be granted permission to go to the playground for a few minutes; and children out of class stand out dangerously in the secondary school. So the child who wants to sneak out of part of a lesson has to give the toilet as an excuse, and actually has to go to the toilet. But wait a minute! Secondary school toilets are unpleasant phenyl-smelling places which offer no comforts other than their fixed utilitarian ones. Ten minutes in a toilet block is quite unlike ten minutes in a coffee lounge or cafeteria; and if pupils who don't really need to go prefer to be there rather than in lessons, then this says precious little for the attraction of these lessons. It would be reasonable to suggest that a classroom situation which is more odious to a child than hiding in a toilet might be educationally suspect, and that keeping children within such a classroom situation might have little if any educational worth for those particular children.

Schools are like offices and factories in one regard, namely that within these institutions the only place you can legitimately be, if you are not at your work in work time, is in the toilet. Schools, however, have different purposes from offices and factories, and it is somewhat strange to find similar institutional accountability demands in a situation supposedly geared to personal growth of the educational sort. Actually, pupil accountability is pushed to an amazing degree in secondary schools. Any pupil consigned to the corridor knows that every passing teacher will ask: 'Why are you here?'. A child seen crossing a quadrangle mid-lesson risks answering a stentorian call of: 'WHERE SHOULD YOU BE?' Pupils are always questioned if they are discovered out of lessons or if they are found in unusual places, and no reason is sufficient or acceptable for not being where the administration has decreed that one should be. No reason, that is, except permission, which is the same as being where the administration decrees. So pupils seek permission (and sneak off to toilets), or else they lie and hope to get away with it: few are sophisticated enough to walk around looking serious and carrying an official-looking document. In a supposedly educative place pupils are discouraged from thinking for themselves on basic matters like when they will go to the toilet, or whether part or all of a particular lesson has value for them at a particular time. Pre-school kindergartens allow the first concession, but only some tertiary institutions grant both.

The central purpose of this section has been to point to some educational problems which arise from the organisational and administrative convenience (not efficiency) of dividing up a day such that all pupils have fixed lesson times and the same fixed recess times; and I trust that it has become evident that the educational function of the school suffers from such an arrangement. The largest issue involved, and the one that is supposedly most supported from the educational perspective, is that of requiring all pupils to be in attendance for the full duration of all lessons; and here

especially I trust that I have demonstrated that this principle is not educationally sound, and is in many ways potentially harmful. It is a principle which could only seriously be supported from the point of view of institutional organisation; and the educational props given to it are little more than rationalisations from administrators.

Two final aspects which further demonstrate the administrative rather than educational basis of the school-day structure can now be highlighted. The first emerges when we question a premise tentatively accepted earlier; namely that pupils must be present in lessons to gain the educational goodies which the school has to offer. Clearly that premise is false. Short illnesses, family vacations, religious holidays, and the like, legitimately deprive individual pupils of about one hundred lessons a year, and yet those who would have benefitted from them catch up anyway, usually in less time than the lessons took. Children who miss lessons can find out what happened from class-mates; they can catch up from text-books, seek the help of their parents or older siblings, or simply learn the work themselves. Children do these things all the time. *They* know there is little if any educational trauma involved in missing the occasional lesson: they also know that one gets into administrative, not educational, trouble for missing lessons without adequate reason. The notion of "adequate reasons" brings in the second, and closely related, aspect to be considered here. Put bluntly, while certain valid educational reasons are not, as we have seen, acceptable as justifying a pupil's absence from classes, administrative reasons *are* accepted, and pupils absence are *encouraged* on administrative grounds. Children are allowed to miss classes, or parts of lessons, in order to travel to sport, to carry a message round the school, to be the deputy's runner, to collect class lunches from the tuck-shop, to ring the bells, to fetch equipment and books forgotten by the teacher, to buy teachers' lunches and cigarettes, to sell raffle tickets or collect for charities, to collect or return text books, to mount prefect duty on the stairs before a recess, to front the Principal on a behavioural charge, and to help unload the shipment from Government Stores. Part of what every pupil knows is that you can get out of lessons *if you can land a job*. Add to this the all too common practice of giving these jobs to the slower learning children, those who most need what lessons are supposed to be offering, and the priorities in the school become frighteningly obvious.

Lesson Time

The school day is merely part of the framework of secondary schooling. As everybody knows, the nitty-gritty of the school's educatonal function lies fairly and squarely within the lessons themselves. Look at the lessons, and there surely we will see almost total educational concern, with no absolute minimum of administrative interference.

Not true. In this section I will demonstrate that the 'educational pillars' of the secondary school, the *lessons*, are dominated by administrative organisational concerns which very largely drain any educational nature from them, and that they too can be characterised as 'educational absurdities'.

At any particular moment of lesson time, every single child (except those on jobs) is expected to be at a lesson; which means being part of a form and a particular class, sitting in a classroom, and doing a subject under the guidance of a single teacher. Each lesson will generally be of 40 minutes' duration, and there will be eight of them in a school day. The secondary scholar will experience from four and a half thousand to ten thousand of such lessons. The pattern is very familiar; but if familiarity breeds contempt it also breeds complacency and resistance to change; and this lesson pattern is so entrenched, and has been for so long, that it appears to have become sacred and inviolable. When the Wyndham Committee confronted the task of totally restructuring secondary schooling

in New South Wales, they came forward with a host of major changes, but all set within the unquestioned and unruffled daily pattern of 'eight, forty-minute, one-teacher-to-a-lock-step-class, subject-centred lessons'. 'So, what's wrong with this from an educational point of view?' you ask. Plenty!

Let's start with the notion of eight forty-minute lessons to a day. The reason for this being the basic structure of the school day appears to have been lost in antiquity, if one was ever formulated at all. There seems, of course, to be some *prima facie* sense in the idea. The adult working day is fixed at around eight hours, so the child's working day should be a little less. Primary school lessons are usually of thirty minutes' duration, university classes run from fifty minutes to an hour, so forty minute secondary school lessons fit nicely in between; and eight such lessons along with two recesses conveniently fill a six and a half hour day. All of this makes sense, but there is little that is educational about it, and when we look for educational evidence to support the supreme efficacy of the forty-minute lesson unit we find the field remarkably bare. Now it is not my purpose here to argue that forty minutes is necessarily a bad time for a lesson unit, or even to suggest that there may be a better time. What I am concerned with *is that setting any fixed time for all lessons is an educationally absurd practice* which causes the educative function of schooling to become subordinated to arbitrary, non-educational, and irrelevant concerns; which imposes ridiculous and educationally harmful demands on teachers, and which develops and reinforces some dangerous notions, responses, and attitudes in pupils.

In secondary schools, lessons (the foundation units of educational function of the institution), are universally cast into a single form with regard to duration, so that what we have is not merely forty-minute lessons but forty-minute lessons (discounting double periods) in every situation. This universal time span applies to first-formers and sixth-formers, yet we might reasonably suspect there to be some difference in attention and concentration spans between twelve-year old children and eighteen-year old adults. It applies to fast learners and to slower learners, where again there just might be similar differences in concentration and attention. And with some qualifications it applies to all subjects, or at least all 'theoretical' subjects, as if it were the case (again there is no supportive evidence) that the optimal learning-unit time for geography is the same as that for history, or that poems can best be appreciated and geometric progressions summed in forty-minute units.

Since lessons go for forty-minutes, teachers plan for forty minute lessons. Thus they plan out their work in terms of, and tailor their content and method to an overriding arbitrarily-determined factor which is usually unsuited to the content they are presenting, and/or the children they are presenting it to. Teachers parcel content into fixed-sized lumps rather than into the more natural units which it might otherwise have fallen into. And that which can't easily be made to fit the standard lump might either not be presented at all, or else given in an ineffectual and incomplete way. For instance, highly suitable fifty minute films are rarely shown, mainly because of the thankless hassles involved in trying to organise for such an irregularity; relevant broadcasts and telecasts are missed when they don't coincide with the set lesson period, or are turned off midway when the bell goes; and those things which aren't covered in the lesson units are often consigned to homework, that is to a situation (possibly a more educative one) beyond the school. And most commonly of all the lesson ends, or is ended, when the bell goes; no sooner, no later, and regardless of any educational factor.

Teachers cannot end their lessons early, even for the soundest of educational reasons. And so, when the 8G maths class is burnt out after thirty minutes of its 7th period maths lesson on a sultry

Friday afternoon, the teacher must keep that class within its room, doing maths, and doing it reasonably quietly. Now faced with this fact of school life, the teacher can do a number of things: like demand the impossible from the pupils, thus putting them in a situation where their risk of punishment is raised, and mutter about pupil laziness and lack of appreciation; or overload the lesson with time-consuming motivation-deadening drill; or slow down the lesson, and thus offer good training for those pupils destined to become piece-workers; or offer games in the last ten minutes, which tends to brand the educative 'work' aspect of the lesson distasteful and something which has to be got through before the fun and rewards can be had. So many lessons which should have been brought to a close because they have, for all educational intents and purposes, come to a close, are pointlessly strung out until the omnipotent bell brings relief to all concerned.

Just as lessons cannot be ended early, nor can they be extended, even if motivation and interest is running at its highest, or if the very point of the lesson is about to be reached. The bell which signifies the end of the lesson also signifies that the children are required elsewhere, by a teacher who will not tolerate them coming late, and that the room is also required by another teacher and a class beginning to line up in the corridor. So the ringing of a bell, even accidently at the wrong time, is sufficient to allow the binomial theorem to be left half expanded or the play not quite finished, and to cause all to pack up and move. There are some rather bad immediate contingent results of this. Pupils, like Pavlov's dogs, become conditioned to bells, and pack up literally and figuratively once the bell rings; and every secondary school-teacher knows the hassles involved and the eventual utter futility in trying to go on, even for a moment, after the bell. A great deal of psychological research has told us that the first and last parts of a unit are most efficiently learned and are best retained; but teachers are generally unable to take advantage of one aspect of that knowledge by providing neat little summaries of what has been covered at the ends of their lessons.

Both pupils and teachers in our secondary schools come to see the learning experience as compartmentalised and ultimately dominated by the bell. It is totally inconceivable that at 10.21 am, or 10.19 am if the wet-weather timetable is operating, all pupils in a school will be ready to stop learning one thing and start learning another. *And yet ready they are!* Because one thing all pupils in all secondary schools learn is that lessons go for forty minutes; and only the bell can determine when they shall start and end. The learning is very thorough. At university, where there is no bell and where there might be no next class to go to, students automatically pack up at five-to-the-hour, regardless of the state of the lecture or discussion in progress. The final result, for pupils and teachers, is the shelving of educational concerns, and the acquisition of unthinking obedience to ringing bells. The epitome of educationally-subjugated-bell-domination can be found on those rare occurrences when the bell fails to go for some reason or other. Dissonance sets in; teachers and pupils are poised to move but move not. A messenger might be sent to the deputy; people watch corridors and playgrounds for signs of movement. Lessons drag on embarrassingly; and if the teacher finally finds the courage to dismiss the class the reason given is not: 'Well, that's an excellent place to leave the lesson', but rather — 'The bell should have gone!'

Fixed inflexibly timed lessons are educational disasters. They force teachers to teach in unsound ways, to divide up content falsely, and to restrict the content they can present. Some run too long and so demand the impossible from some pupils; others end too soon and kill interest and motivation in other pupils. All reinforce the notion that teaching and learning is subject to an external criterion, namely the organisa-

tional interests of the school. Consider what chance the teacher of 8G maths would have of convincing the Principal of the imperative need, educationally, for cutting 8G's lessons back by ten minutes. No chance at all; perhaps just a sympathetic ear, and a resigned reply that it couldn't be done in practice. But this same Principal will blithely cut ten minutes off lessons because of inclement weather, because it's the day the scripture teachers come, because there is a visiting speaker, or because an assembly is to be called to congratulate the victorious 1st XV, to lay down school rules, to emphasise the need for good behaviour in the buses, or to announce the winner of the P & C raffle.

Now it might be argued here that universally-fixed-time lessons are more than an administrative convenience; that they are, for all their short-comings, an absolute necessity. After all, they ensure that teaching, and hopefully learning, does go on in the school. They ensure that no pupils miss lessons because their teacher is extending another lesson with a different class; they confine between-lesson chaos to specific times so that lessons are not disturbed by randomly wandering pupils; they bring about the reasonable employment of teachers and an effective use of the school's physical resources, and so on. There are two things to be said to this. First, while the principle might bring these things into being, it is not the only way of ensuring that such things occur in a school. Second, we would have to query the point of gaining such achievements if the lessons generated in the process are so detrimental to the whole educative experience. The situation is somewhat analogous to a factory which, in striving for the more efficient production of anti-heart-attack pills (whose worth is suspect since they only benefit well 'patients') induces more and more heart-attacks among its workers. But analogies aside, the sad fact is that the whole of our secondary education is based on the administrative convenience of the universal forty-minute lesson, which is unsuitable for most learning experiences, most classes, and all individuals. We have succeeded in reducing potentially educative experience into an administrative masterpiece, and a clockwork nightmare.

So much for the forty-minute lesson. Let us now look more closely at the *classes* which are doing those forty-minute lessons. Here again we find that from first form to sixth form, for fast learners and slower learners, for discussions in literature and demonstrations in science, there is one *single* structure maintained: namely one teacher, and a pupil group numbering from ten to thirty-five. Now basic though this 'single teacher in charge of a class' principle may be to our secondary schools, it is not the only way to organise learning experiences, and it is anything but the best way from an educational point of view.

The most serious problem generated by the teacher-class principle is that it reinforces a false notion, namely that knowledge (or at least worthwhile knowledge) resides in and can be passed on only by a professional authority. And by reinforcing this notion is makes pupils suspicious of their own worth, and it further incapacitates them from organising their own learning experiences, or teaching or learning from each other, which most children did very well before they entered school, and which some still manage to do in outside-school activities. What happens in the school lesson is that if the teacher doesn't turn up there is no lesson. The class either riots, or if it is more sophisticated, plays up quietly. The pupils do not organise their own learning. Even university students, who have a wealth of things to pass on and discuss, walk out and disperse if the lecturer does not turn up. And so conditioned are they that they will even break up a small seminar which is to be led by a *student* if, for some reason the lecturer in charge is absent. The school, through explicitly and implicitly stressing that worthwhile learning can only take place under the guidance of an institutionalised authority, seriously misrepresents the whole rationale of the educational venture. It stops the mutual sharing of knowledge either explicitly by forbidding it — children are often not allowed to ex-

plain things to each other in class or ask each other questions, this being variously interpreted as talking, copying, or cheating — or implicitly by continually reinforcing the role of the teacher as authority ('If you want to ask questions, put your hand up and ask *me*'), judge of worth (how many children get to mark each other's work?), and examiner.

Other points against the teacher-class principle are more pragmatic in nature. The principle means that there can be no provision, or no legitimate provision, for a few pupils to pursue a particular study. If the number of pupils desiring a particular elective does not exceed a specified minimum, or if it overloads a teacher, then the study will effectively lapse. Thus, whether a particular child studies H.S.C. Music may depend on nothing more than which school that child goes to, or how many others want to pursue a similar study. And whether another child gets to do Commerce or Level I Mathematics may depend on nothing more than how many Commerce teachers there are at the school, or whether an overworked mathematics teacher is willing to give up precious lunch-times. These are funny limitations to put on supposedly educational purposes. Another point against the basic structure is that it gives pupils no opportunity to experience, learn from, or even imagine the possibility of teachers disagreeing, discussing and arguing amongst themselves. Finally, as a more general point, it prevents and discourages experimentation with alternative teaching/learning experiences. This final point leads us to a wider area of discussion.

The teacher-class structure implies that there is one worthwhile learning situation, and one only. Now as with forty-minute periods we can discover a lot, not by looking for another structure, but by recognising the inadequacy of the ***universal application*** of this,or any other single structure.

There are obviously many situations where the basic structure outlined is lacking, and possibly inefficient. It is surely not necessary for every sixth-form poetry discussion to be 'led' by a teacher; or it might be of the greatest benefit for three teachers to attend one such discussion, thus leaving 12B and 12C in the neighbouring rooms free to produce *Othello* for themselves. On the other hand, given that in one week six teachers are each going to show their second form classes a particular film, it would probably be far better to lump all the classes together in an auditorium at the one time, and also free up to five of the teachers for other activities. There are many instances in any school day where what is done by one teacher for thirty pupils could be done just as effectively for three hundred, where no teacher is needed at all, where there would be overall benefit to a class if many teachers were present, and where learning could take place in groups smaller than the normal minimum class size. Let us consider this last issue a little more closely.

Teachers often muse about the 'utopian' ideal of one teacher to one pupil, an ideal which, they believe, can never come into practice in schools. But is this really utopian? Is it really impossible to organise and incorporate a 1:1 teacher/learner situation in the secondary school? A little exercise might be in order here.

Imagine that a teacher takes a maths class of thirty pupils from form 1 to form 4, that is, to School Certificate level. There are about forty-two teaching weeks in each year, maths is timetabled for six periods a week, and the periods are of forty minutes duration. This makes a total, over four years, of 1008 periods, or 40,320 minutes of maths; which works out, in a statistical sense only, at 1,344 minutes per pupil, or just over 22¼ hours. Now that 40,320 minutes is only a theoretical figure. Examinations, excursions, play days, end of third term wind downs, swimming schools and the like wipe out, at a very modest estimate, 25% of timetabled lessons. So

a more real figure for total lesson time is 30,240 minutes. Now at least five minutes of every lesson is lost in getting the thing started, so an even more real time is 26,460 minutes. Here let us *pretend* that no further time is lost; that is, that all this time is *teaching* time, with no interruptions, announcements, teacher absences, staff meetings, discipline matters, money collections, text book distributions, etc. This means that pupils are exposed to 26,460 minutes of maths teaching time (although each pupil misses about 3,000 through personal absences) in a class situation, where a large amount of the teaching time is taken up by activities such as supervising drill and revision, catching the slower pupils up, and testing, which do not constitute teaching time for *every* individual pupil.

Theoretically, therefore, the child is timetabled for the equivalent of 22¼ hours of individual teaching time over four years; and in practice, gets about 65% of total allocated time in an inefficient class situation with 29 other pupils, where, if the truth be told, even more than half of this is not taken up with effective teaching. So, if we are serious about education, why not timetable each child for 22¼ hours in 89 individual fifteen minute lessons? This would not increase the teacher's allocated time load one iota: and all teaching time would be real, not statistical teaching time, in an effective situation with one pupil at a time, no discipline problems, no interruptions, no period lag, nothing. Nor would it necessarily decrease the pupil's learning time, although it might. Each pupil would be able to seek out the teacher's individual help 89 times in quarter hour periods, or 134 times in ten minute periods, or whenever, for as long as required — an hour this week, two minutes the next: as for drill, revision, practice and so on, these can be done as they are now done, from the text-book or issued sheets with answers provided, with little or no teacher contact except where help is needed. Although I have no empirical evidence to support this it is my serious guess that maths would be learnt more efficiently by more pupils using this method; that those who now pass the School Certificate would still do so; and that far fewer children would fall by the wayside. And if we continue not to be allowed to accelerate pupils, then the possibility arises of transferring a faster learning child's unused time to benefit a more demanding and needy pupil. Finally I might add that whereas I think 89 quarter hour sessions would be ample individual instruction for the average child, I also recognise that the figure might look quite small and frightening. Does 178 quarter hour sessions in groups of two, or 269 ten minute sessions in groups of two, or 403 ten minute sessions in groups of three, etc. appeal to you better? Or do you, as a child, teacher, or interested onlooker, still want to stay with theoretically 1,008 (but really only about 750) forty (but really less than 35) minute sessions in groups of thirty, with all that we know they entail?

'Aha!' you cry again, 'That *may* be well for maths, but what a terrible way to teach poetry or drama. And what about discussions in history and social studies, or demonstrations and experiments in science?' Thank you. That's my point precisely. Different subjects, and even different parts of subjects, not to mention different pupils and different teachers, lend themselves to *different* teaching/learning experiences. But we ignore this piece of educational wisdom in our system and impose one universal structure over everything and everybody, and to make it so much worse, a structure which is notoriously inefficient, destructive of teacher energy, deadening to individual pupils, and quite unsuited to the vast majority of those learning experiences which it lamely brings into being.

With that said, let us now take a closer look at another issue. Consider any particular child in an 8A maths class; that is, among the best thirty for maths. The child may not be quite so good at history, but thanks to the system now in operation the child can drop to a more appropriate level for that subject, and so be in the 8C history class, and also in the 8B French class and so on. All very com-

mendable, and surely worth the organisational trouble involved. But hold on just a minute! We tell a lie! That child in the 8A maths class is not among the best thirty at maths, but rather *among the best thirty at maths of those who started at the school the previous year*. In fact the particular child in question may be the best at maths in the whole school, and know all of sixth-form maths, but being thirteen and having started secondary school last year is sufficient to put the child in second form, and in second form *for everything*. And the only way out of second form is to wait for next February, when, regardless of anything short of a tragic death, advancement to third form will occur, when the child will be in third form *for everything*. There is something terribly wrong with this. To expect a child studying (say) six 'distinct' subjects under six separate teachers to advance uniformly in each (between February and November) verges on the ridiculous.

There are two well established facts which need to be attended to here. The first is that in any form it is common to find a three year range among the pupils; the second is that individual pupils have up to about a three year range across their abilities in various subjects and skills. Admittedly most of the figures available are concerned with retardation rather than acceleration, since it is obviously far easier to find instances of children behind the set norms than it is to find those who would be ahead in a system which promotes everybody but accelerates none. However what this means in practical terms is that, in any comprehensive secondary school drawing all the children from a geographic area, the third formers in maths will range from first form to fifth form standard as far as their mathematical ability and potential progress is concerned (this ignores the few but nevertheless real extreme cases), and that any paticular child in third form might have abilities and potentialities ranging from first form level to fifth form level in the different areas being studied. Thus only a proportion of the third formers will be at their 'right' level for maths, and of these only a smaller proportion will be at their 'right' level for everything. Therefore the chances of any child being at any time in the right lesson are extremely low. Now obviously we are talking in generalisations and without accurate statistics; but all secondary teachers know that in every one of their classes there are pupils who can't handle the work, and/or pupils who could profitably advance if they weren't held back.

Keeping children in lock-step progression, in the one form for everything, must be the clearest instance of educational absurdity that we could find in our secondary schools. And allowing pupils to select their levels within forms, while it is a move in the right direction, is hardly a sufficient answer, since the range for selection is far narrower than the ranges of selectees. But keeping children in lock-steps makes for administrative convenience and neatness. If there are 147 pupils in second form in March chances are good that there will be 147 in November, and that the school can plan and organise for 135 third formers next year. The school can swing into a routine, and maintain that routine with a comfortable sense of security; and the only ones who suffer are the children who get a calendar year to do all and only second form work before they are automatically promoted for another year's work. But really, imagine the chaos if a child, after twenty-one months in a secondary school, was doing fourth form work in a couple of subjects, third form work in one, second form work in another and first form work in the rest. Heavens! Which roll class would we put such a trouble-maker into?

Nothing can be said in favour of lock-step progression from an educational point of view; (and no; it's not the only way that a school can be run). It means nothing less than that, with regard to those four thousand to ten thousand lessons which each child attends, almost all pupils at any time are in the wrong one, being either further up than they

ought to be, or further down than they could be; either advanced to positions they are not ready for, or restrained from reaching positions they could hold. The system is like horse racing, where every horse becomes one year older on August 1st. But we are more considerate of the abilities of horses than children. True, we have special races for 3 year olds, but not all races are like this. We don't insist that four year olds enter every four year old race, or that they race only against four year olds. And while we know that three year olds rarely win the Melbourne Cup we don't forbid them from contesting it, and we exalt them if they are successful. But no twelve year old child can race against eighteen year olds in sixth form classes, or contest the Higher School Certificate Cup, even if track work clearly indicates the ability to do so.

The last point I want to look at with regard to lessons is the actual content of them. Lessons, in our secondary schools, are lessons in *subjects* and while I am certain that there is something basically wrong with this, a serious attack on 'subjects' would require a longer and tighter argument than I am concerned to offer here. Therefore a couple of suggestions will have to suffice.

A subject curriculum is not the only possible type of curriculum (this is a point which surprises many people, especially trainee-teachers who have known nothing else, and who are being prepared to teach one); and it is a curriculum type which has many things against it. It can be argued that it divides knowledge arbitrarily into compartments where there are no real bases for demarcation; but even if we avoid heavy epistemological discourse on this point we can still recognise some of the more practical effects of such a move. The only place a child learns in subjects is in school type institutions; and this sort of learning perverts the ability to learn in the total related way in which children learn that truly vast amount of knowledge which they carry with them on their first school day. At school children learn subjects, and the distinctions between subjects, rather than grasping the complementary and indivisible nature of knowledge. They learn that Mathematics is not English, that English is not Geography, and that each must be studied separately. Here I can pick up an earlier point about a child being allowed to do only lessons in lesson times, because that point was not precise enough. The truth is that the child is allowed to do only the appropriate subject in the appropriate lesson time. Thus we get situations where the child is told that it's intrinsically worthwhile to pursue geographical studies, but bad to pursue such studies in mathematics lessons — which is another way of saying that institutional organisational demands must take precedence over that which is considered intrinsically valuable from an educational point of view — so that the child caught doing geography in a maths lesson will be castigated and/or punished for it. But one of the worst aspects that extends from subject curricula is that the descriptions which are given to arbitrary areas of knowledge are also often 'applied' to children. Thus children can come to be described and categorised as 'good at maths but hopeless in geography', or can learn from their reports that their personal status can be raised if they concentrate harder on history, and do more work in French.

Subjects can be attacked on their arbitrariness, their compartmentalising nature, and their inappropriateness to both learning and problem-solving situations in real life. But since this was not intended to be a full argument, the matter shall be left here, with only the final point that one of the very few things that can be said in favour of subject curricula is that they make for ease of organisation in the school.

I have argued in this section that the four basic features on which all secondary school lessons are built, namely fixed-times, one teacher to a class, lockstep classes, and subject curricula, are positively harmful to and actually pervert educational endeavours, such that the lessons brought into being are actually

educational absurdities. I have also argued, implicitly at times, that these features are retained, or could be justified, only for administrative reasons, and that secondary schools clearly give precedence to administrative concerns over educational matters. It is that latter notion which now requires further development.

The Place of Administration in the School

Let us begin here by considering the role of the teacher in the secondary school. Teachers, it might be thought, are employed to teach. Clearly they are trained to teach; and to this end they learn their subject content, teaching method, and pursue a conglomeration of educational studies while learning little about school administration. In practice, however, they do a heck of a lot of administration, and this leads to a fascinating phenomenon. A teacher is trained to teach, is employed to teach, and teaches; and if the teaching is done well the extrinsic reward is promotion. Now the strange thing that occurs is that all promotions within schools are in the direction of *less teaching* and more organisation and administration. The good assistant teacher will take over a subject department, and so do lots more administration but only about two-thirds of the teaching previously done. The next step up is deputy principal, which is an organisational job interfered with by about a quarter of the assistant's teaching load. The highest point, the ultimate goal, is Principal; and the teacher who makes it to the top as a teacher runs a school but never teaches. Clearly the way *up* for teachers is away from teaching and into the offices lining the corridors of power. The 'top' teachers are put into organisation; the lesser, weaker, or inexperienced ones carry out the practical educational functions of the school. The priorities are patently obvious! Could we blame aspiring teachers for concentrating on the administrative side of the school, learning how it works, finding where the buttons are, and trying to prove that they too are capable of pushing those *same* buttons? After all, that is what really counts. And that too is part of the reason why administrative schemes are retained, refined and continually polished, rather than questioned. It is in administration that the vested interests lie — one must show that one can make a smoothly running school run more smoothly — which is enough to channel one's skills away from both education and experimentation. It is really ridiculous to suggest that a school which was primarily interested in education might *increase* the teaching duties of staff as they gained competence and experience; and leave the compilation of form rolls and general result sheets, issuing bus passes, playground and bus duty, timetabling, allocation of 'extras', forwarding forms to Area Office, running assemblies, etc., to those not competent or experienced enough to carry out full teaching roles; or to other non-teaching staff?

The point, of course, is that secondary schools are not concerned primarily with education. There's the whole business of social control and the reproduction of bearers of labour power to consider, which has so much to do with casting the teacher into a triple role of transmitter of knowledge, administrator, and child custodian; with keeping kids in lessons, jumping to bells, and moving in lockstep progression; and with bringing administrative concerns to the fore over educational issues in the secondary school. But that's another story, dealing with the background and basis behind and beneath those surface features considered in this paper; and as mentioned previously, I have told that story elsewhere.

Conclusion

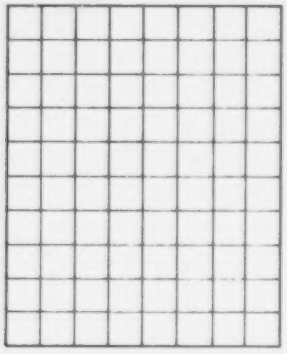
Secondary schooling is organised around a series of largely unquestioned principles which result not in education, but in the smooth and efficient transpositions of a thousand people within a confined space. This organisation is objectively manifest in the master timetable,

which provides a place for everybody at every moment of the day, always with the right number and right proportion of people in each place — one class to a room, one teacher to a class, and everybody moving together at the same time.

Every February the schools are switched on, and the complicated clockwork goes into operation. Bells sound, and the school reconstitutes itself every forty minutes. Thousands of children switch off geography; they are ejected into corridors, fussed and fumbled on stairs, and are plucked into other rooms where they switch on maths. Hundreds of teachers leave the square on the hypotenuse unequal to anything as yet, have a quick smoke in the corridor, and slip into other rooms to multiply a^m by a^n, while watching out for any malfunctioning pupil whose geography switch failed to close. The Principal, standing on the balcony, times the whole business as taking less than five minutes, smiles, and asks the delegation from Nigeria to note how smoothly it all happens.

This is the secondary school, whirring away, lesson after lesson, day after day, for up to six years of a child's life. It is a clockwork administrative masterpiece; but on the other hand a jingling absurdity, where education is at best a long way off in second or third place, at worst non-existent, and occurring accidentally if it occurs at all. □

Annotated bibliography



Gale, R.M. (ed.) (1968), *The Philosophy of Time: A Collection of Essays*, Macmillan, London.
A very good collection of essays on time by early and more contemporary philosophers including Aristotle, Plotinus, St. Augustine, Bergson and Grunbaum. Essential reading for students examining the concept of time would be Gale's own introduction to the section 'What then is time?'. This then should be followed by Aristotle's essay on 'Time' and St. Augustines's work 'Some Questions about Time'. For more recent discussions concerning the notion of time students should read Barnett's 'The Flow of Time', Bergson's 'Form and Becoming' and Grunbaum's 'Modern Science and Zeno's Paradoxes of Motion'.

Locke, J. (1975), *An Essay Concerning Human Understanding* P. H. Nidditch (ed.), Clarendon Press, Oxford.
Locke's work on the philosophy of time is important because our modern perception of time is a legacy of Locke's philosophical development of Newton's linear time. Locke discarded the circular imagery of time which many primitive and ancient philosophers had ascribed to the notion of time. He saw time instead as a single straight line extending into infinity. Perhaps the most important chapter to read is Chapter XIV, 'Of duration, and its simple modes'.

Whitrow, G.J. (1980), *The Natural Philosophy of Time*, Clarendon Press, Oxford.
This book is a very good survey of the main ideas and problems which relate to the notion of time. While concentrating on the philosophical aspects of time the author also delves into the recent problems associated with mathematics and physics which have arisen through the work of Einstein and quantum physics.

Wood, N. (1983), *The Politics of Locke's Philosophy: A Social Study of 'An Essay Concerning Human Understanding'*, University of California Press, Berkeley.
An excellent book which should be read in conjunction with Locke's own work as set out above. Wood attempts to place Locke's philosophical writings within their political and social context. He argues that Locke's Essay was concerned with advancing the 'spirit of capitalism' by depicting the ideal of the 'rational' man as self interested, industrious and sober. Wood points out that in fact Locke's Essay is a weapon used by the then socially progressives (the newly arising capitalist class) against the conservative elements in society.

Zwart, P.J. (1976), *About Time*, Elsevier, New York.
An interesting book which deals with the philosophical inquiry into the origin and nature of time. The student of time should

read, especially, Chapter One 'The problems of time', Chapter Two, 'Three views on time' and Chapter Three 'Origin and development of the concept of time'. While the overall aim of the book is to clarify some of the important philosophical issues about time the chapters tend to stand, in some way, apart from each other. As a consequence chapters can be picked out and read in some degree of isolation.

Aguessy, H. et al. (1977), *Time and the Philosophies*, UNESCO, Paris.

A compilation of essays on time by a number of eminent philosophers. The essays encompass radically different approaches to the philosophy of time. On the one hand it is the approach by the analytical philosopher who is concerned with reducing time to its conceptual minimum. On the other hand it is the philosopher as thinker and mediator who is concerned with implanting in the human experience of time its maximum spiritual and cultural content. The sections by Ricoeur on 'The symbolic structures of our cultural experiences of time' and Gadamer on 'The western view of the inner experience of time and the limits of thought' should be read.

Thompson, E.P. (1967), 'Time, work-discipline and industrial capitalism', *Past and Present*, no. 38, pp. 56–97.

This is the classic paper on time and its relationship to the organisation of work under industrial capitalism. Before the rise of capitalism there was an essential irregularity in the organisation of work. However with the concentration of the labour process in factories workers had to be synchronised and taught the value of time-discipline. However Thompson points out that these efforts have never been totally successful as the spirit of St. Monday is still a powerful influence on labour.

Reid, D. (1976), 'The decline of St. Monday 1766–1876', *Past and Present*, vol. 71, pp. 76–101.

This paper should be read in conjunction with Thompson's work as it adds a superbly rich, cultural flavouring to the historical development of our perception of time. Reid attempts to explicate the history and customs of St. Monday. He is particularly interested in the influence of St. Monday on work and leisure habits in Britain.

Pollard, S. (1963), 'Factory discipline in the Industrial Revolution', *Economic History Review*, vol. 16, no. 2, pp. 254–71.

Another important seminal paper which looks at the transformation of long held cultural concepts required in a society which is industrialising and where labour has to be regularised and disciplined to factory work.

Mumford, L. (1973), *Interpretations and Forecasts*, Harcourt Brace Jovanovich, New York.

This is a collection of essays which were written over the length of Mumford's academic life. The most important chapter for students of time is Chapter 25 'Mechanization of modern culture'. He argues that the mechanisation of modern society and its concern with quantification and measurement can be traced back to the regular measurement of time. From this argument he concludes that it was not the steam engine but rather the clock which was the foundation stone of modern industrial capitalism.

Thrift, N. (1981), 'Owners' time and own time: The making of a capitalist time consciousness, 1300–1880', in A. Pred (ed.) *Space and Time in Geography*, C. W. K. Gleerup, Lund.

Thrift, in a brilliant essay, outlines how the traditional culture and instrumental work activities were collapsed into a one-dimensional society reflecting the economic rationality of capitalism. The needs of this rationality for quantification and calculation brought about a transformation in the perception of time. This new type of time has become taken for granted as part of the dominant hegemony.

Landes, D.S. (1983), *Revolution in Time: Clocks and the Making of the Modern World*, Harvard University Press, Cambridge, Mass.

A fascinating book which argues that the invention of the mechanical clock was one of the most important and significant events in the history of the human race. Landes points out that much of our present day society especially our economic, cultural and political concerns are dependent on the taken-for-granted measurement of time.

Foucault, M. (1977), *Discipline and Punish: The Birth of the Prison*, Vintage Books, New York.

A powerful book which is essentially about prisons. Foucault documents how penal institutions and the right and power to punish other human beings have become ingrained in our present-day society. He argues that in the seventeenth and eighteenth centuries disciplines related to time, space and movement became general forms of domination.

Giddens, A. (1979), *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*, Macmillan, London.

Giddens, A. (1981), *A Contemporary Critique of Historical Materialism, Vol.1, Power, Property and the State*, Macmillan, London.

These are powerful books which have a profound influence in all areas of social science and which further develop Giddens's theory of structuration. Through this theory Giddens seeks to resolve the

problems inherent in the traditional functionalist view of society and organisations. Important, in especially the latter book, is Giddens's argument relating to the commodification of time.

Denham, C. and Lieberman, A. (eds.) (1980), *Time to Learn*, National Institute of Education, Washington D.C.

Anderson, L.W. (ed.) (1984), *Time and School Learning*, St. Martin's Press, New York.

Both of these books reflect the interest that time-on-task has within the American educational scene. However both take essentially a technicist, functionalist view of time and education. The philosophical and historical legacies of the notion of time are glossed over and we are presented with a taken-for-granted perception of time.

Levin, H.M. (1980), 'Educational production theory and teacher inputs', in C. E. Bidwell and D. M. Windham (eds), *The Analysis of Educational Productivity*, Ballinger Publishing, Cambridge, Mass.

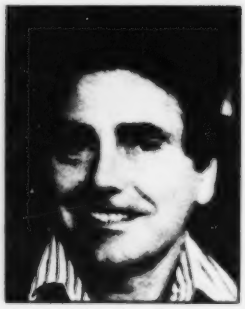
Levin, H.M. (1984), 'About time for educational reform', *Educational Evaluation and Policy Analysis*, **6**(2), 151–63.

Levin, H.M. (1984), 'Clocking instruction: A reform whose time has come?', in *I. F. G. Policy Perspectives*, **5**(2), 1–4.

Levin, H.M. and Tsang, M.C. (1984) 'The economics of student time', Program Report No.84-B9, Institute for Research on Educational Finance and Governance, School of Education, Stanford University.

In these series of papers Levin attacks the mechanistic, technicist view of time as a factor in the learning process. He argues that other factors which are more instrinsic are much more essential in learning. He suggests that factors such as a greater internal participation in the educational decision making process are more important than the mechanistic, production view of time, inherent in time-on-task.

About the author



Peter Watkins had been a teacher in the Victorian Education Department for twenty years before joining Deakin University. He completed an MEd in educational administration at Monash University, studying the power relationships in five technical schoools. He then commenced doctoral studies, and completed his PhD at Deakin in 1982. The thesis examined a Year 11 group's perceptions of work before and after going out on work-experience. His main interests are the relationships between school and work; organisational power; workplace democracy; and the development of a critical analysis of organisations.

Acknowledgments

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